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(54) Title: BIODEGRADABLE COMPOSITIONS, METHODS AND USES THEREOF

(57) Abstract: Disclosed herein are biodegradable compositions, materials, gloves and methods thereof.

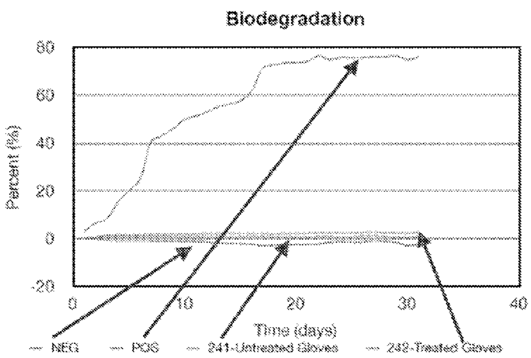

FIG 1A

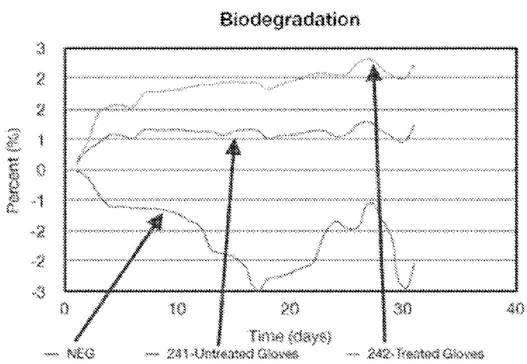

FIG. 1B

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BIODEGRADABLE COMPOSITIONS, METHODS AND USES THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority to U.S. Provisional Application No. 61/695,229, filed on August 30, 2012, and the benefit of priority to U.S. Provisional Application No. 61/787,721, filed on March 15, 2013. This application also claims the benefit of priority to U.S. Non-Provisional Application No. 13/833,193, filed on March 15, 2013, which application also claims the benefit of priority to U.S. Provisional Application No. 61/695,229, filed on August 30, 2012. The entire disclosure of each of these priority applications is incorporated by reference herein in its entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to biodegradable compositions, materials, gloves and methods for the manufacture thereof.

TECHNICAL BACKGROUND

[0003] Plastics and rubbers are industrially mass-produced and at the same time are used widely in daily life and in industrial fields with their usage increasing greatly. One such use is plastic or rubber gloves that can be used in various applications such as for chemical handling and in the health care industry. It is desirable that the products withstand the forces of nature and the wear from their designated use. Many of these types of materials and products do not biodegrade in natural environments, and so in recent years, environmental littering and destruction due to discarded plastics has occurred. Accordingly, in recent years, development of plastics that can be biodegraded in natural environments has been desired.

[0004] Thus, there exists a need for materials, products and methods related to plastic or rubber gloves that can be biodegraded in a natural environment, such as a landfill. Such materials, products and methods are described herein.

SUMMARY

[0005] Among various aspects, disclosed herein is a biodegradable elastomeric material formed from a composition comprising: a) an acrylonitrile butadiene based rubber; b) an alkali stabilizing agent; c) a metal oxide crosslinking agent; and d) a biodegradation agent,

wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[0006] Also disclosed herein is biodegradable elastomeric material, formed from a composition comprising: a) a halogen containing elastomeric polymer; and b) a biodegradation agent, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[0007] Also disclosed herein is a biodegradable thermoplastic material, formed from a composition comprising: a) a halogen containing thermoplastic polymer; b) a biodegradation agent; and c) a plasticizer, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic material in the absence of the biodegradation agent.

[0008] Also disclosed herein is a biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising: a) an acrylonitrile butadiene based rubber; b) an alkali stabilizing agent; c) a metal oxide crosslinking agent; and d) a biodegradation agent, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0009] Also disclosed herein is a biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising: a) a halogen containing elastomeric polymer; and b) a biodegradation agent, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0010] Also disclosed herein is a biodegradable thermoplastic glove, comprising a biodegradable thermoplastic glove material formed from a composition comprising: a) a halogen containing thermoplastic polymer comprising polyvinyl chloride; and b) a biodegradation agent, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[0011] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape; b) contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former; c) drying the coagulant coating; d) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. an acrylonitrile butadiene based rubber; ii. an alkali stabilizing agent; iii. a metal oxide crosslinking agent; and iv. a biodegradation agent, e) curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0012] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape; b) contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former; c) drying the coagulant coating; d) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. a halogen containing elastomeric polymer comprising polychloroprene, and ii. a biodegradation agent, e) curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0013] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. an acrylonitrile butadiene based rubber; ii. an alkali stabilizing agent; iii. a metal oxide crosslinking agent; and iv. a biodegradation agent, to provide a first coating of the composition on the support material; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence “n” times;

wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0014] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. halogen containing elastomeric polymer comprising polychloroprene; and a biodegradation agent; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[0015] Also disclosed herein is a method for producing a biodegradable thermoplastic glove, comprising: a) providing a glove former having a predetermined size and shape; b) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. a halogen containing thermoplastic polymer comprising polyvinyl chloride, and ii. a biodegradation agent, c) curing the coating of step b) to provide an thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[0016] Also disclosed herein is a method for producing a biodegradable thermoplastic glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. halogen containing thermoplastic polymer comprising polyvinyl chloride; and ii. a biodegradation agent, to provide a first coating of the composition on the support material; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[0017] In one aspect, the materials and gloves disclosed herein are more biodegradable in a natural environment (i.e. land fill) than a material or glove without the biodegradation agent. The materials and gloves with the biodegradation agent have substantially the same shelf time and desired properties as materials and gloves without the biodegradation agent. Thus, the biodegradation does not start until the material or glove comes into contact with suitable microbes.

BRIEF DESCRIPTION OF THE FIGURES

[0018] The accompanying figures, which are incorporated in and constitute a part of this specification, illustrate several aspects and together with the description serve to explain the principles of the invention.

[0019] Figure 1A and 1B show a plot of the degradation data after 30 days.

[0020] Figure 2A and 2B show a plot of the degradation data after 65 days.

[0021] Figure 3A and 3B show a plot of the degradation data after 120 days.

[0022] Figure 4A and 4B show a plot of the degradation data after 160 days.

[0023] Additional aspects of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or can be learned by practice of the invention. The advantages of the invention will be realized and attained by means of the elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only and are not restrictive of the invention, as claimed.

DESCRIPTION

[0024] The present invention can be understood more readily by reference to the following detailed description of the invention and the Examples included therein.

[0025] Before the present compounds, compositions, articles, systems, devices, and/or methods are disclosed and described, it is to be understood that they are not limited to specific synthetic methods unless otherwise specified, or to particular reagents unless otherwise specified, as such can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, example methods and materials are now described.

[0026] All publications mentioned herein are incorporated herein by reference to disclose and describe the methods and/or materials in connection with which the publications are cited.

A. Definitions

[0027] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, example methods and materials are now described.

[0028] As used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “a polymer” includes mixtures of two or more polymers, and the like.

[0029] Ranges can be expressed herein as from “about” one particular value, and/or to “about” another particular value. When such a range is expressed, another aspect includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint. It is also understood that there are a number of values disclosed herein, and that each value is also herein disclosed as “about” that particular value in addition to the value itself. For example, if the value “10” is disclosed, then “about 10” is also disclosed. It is also understood that each unit between two particular units are also disclosed. For example, if 10 and 15 are disclosed, then 11, 12, 13, and 14 are also disclosed.

[0030] As used herein, the terms “optional” or “optionally” means that the subsequently described event or circumstance can or cannot occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

[0031] Disclosed are the components to be used to prepare the compositions of the invention as well as the compositions themselves to be used within the methods disclosed herein. These and other materials are disclosed herein, and it is understood that when combinations, subsets, interactions, groups, etc. of these materials are disclosed that while specific reference of each various individual and collective combinations and permutation of these compounds cannot be explicitly disclosed, each is specifically contemplated and described herein. For example, if a particular compound is disclosed and discussed and a number of modifications that can be made to a number of molecules including the compounds are discussed, specifically contemplated is each and every combination and permutation of the compound and the modifications that are possible unless specifically indicated to the contrary. Thus, if a class of molecules A, B, and C are disclosed as well as a class of molecules D, E, and F and an example of a combination molecule, A-D is disclosed, then even if each is not individually recited each is individually and collectively contemplated meaning combinations, A-E, A-F, B-D, B-E, B-F, C-D, C-E, and C-F are considered disclosed. Likewise, any subset or combination of these is also disclosed. Thus, for example, the sub-group of A-E, B-F, and C-E would be considered disclosed. This concept applies to all aspects of this application including, but not limited to, steps in methods of making and using the compositions of the invention. Thus, if there are a variety of additional steps that can be performed it is understood that each of these additional steps can be performed with any specific embodiment or combination of embodiments of the methods of the invention.

[0032] As used herein, the terms “biodegradable elastomeric material” and like terms mean a material that is biodegradable and is an elastomer. As used herein, a biodegradable elastomeric material is not a biodegradable thermoplastic material. Examples of biodegradable elastomeric materials are described elsewhere herein.

[0033] As used herein, the terms “biodegradable thermoplastic material” and like terms mean a material that is biodegradable and is thermoplastic. As used herein, a biodegradable thermoplastic material is not a biodegradable elastomeric material. Examples of biodegradable thermoplastic materials are described elsewhere herein.

[0034] As used herein, the terms "biodegradable elastomeric glove" and like terms mean a glove that is biodegradable and is an elastomer. For example, a glove that comprises a biodegradable elastomeric material is a biodegradable elastomeric glove. A biodegradable elastomeric glove is not a biodegradable thermoplastic glove. Examples of biodegradable elastomeric gloves are described elsewhere herein.

[0035] As used herein, the terms "biodegradable thermoplastic glove" and like terms mean a glove that is biodegradable and is thermoplastic. For example, a glove that comprises a biodegradable thermoplastic material is a biodegradable thermoplastic glove. A biodegradable thermoplastic glove is not a biodegradable elastomeric glove. Examples of biodegradable thermoplastic gloves are described elsewhere herein.

[0036] As used herein the term "biodegradation rate" and the like terms refers to the time for a material or glove to biodegrade to a specific degree. For example, a material that biodegrades 30% in 20 days has a higher biodegradation rate than a material that biodegrades 10% in 20 days.

[0037] As used herein the term "halogen containing elastomeric polymer" and the like terms mean a polymer that comprises a halogen, for example, chloride, fluoride, iodine, or bromide or a combination thereof, and is an elastomer. A halogen containing elastomeric polymer is not a halogen containing thermoplastic polymer. For example, polychloroprene is a halogen containing elastomeric polymer.

[0038] As used herein the term "halogen containing thermoplastic polymer" and the like terms mean a polymer that comprises a halogen, for example, chloride, fluoride, iodine, or bromide or a combination thereof, and is thermoplastic. A halogen containing thermoplastic polymer is not a halogen containing elastomeric polymer. For example, polyvinyl chloride is a halogen containing thermoplastic polymer.

[0039] As used herein the term 'biodegradable elastomeric glove material" and the like terms mean a material or composition on which the biodegradable elastomeric glove is based.

[0040] As used herein the term 'biodegradable thermoplastic glove material" and the like terms mean a material or composition on which the biodegradable thermoplastic glove is based.

[0041] As used herein the term "glove former" and the like terms mean a form or cast of desired size and shape on which a glove can be formed. A glove former can have the shape similar to that of a human hand which shape is transferred to the glove upon manufacturing.

[0042] As used herein the term "reference elastomeric material in the absence of the biodegradation agent" and the like terms means a substantially identical material to a previous recited elastomeric material but for that the reference elastomeric material does not contain a biodegradation agent. For example, if an elastomeric material comprises a 100 parts polymer, 1 part cross-linker, 2 parts filler and 1.13 parts biodegradation agent, then the reference elastomeric material in the absence of the biodegradation agent comprises 100 parts polymer, 1 part cross-linker, and 2 parts filler but does not contain a biodegradation agent.

[0043] Unless otherwise noted, each of the materials disclosed herein are either commercially available and/or the methods for the production thereof are known to those of skill in the art.

[0044] It is understood that the compositions disclosed herein have certain functions. Disclosed herein are certain structural requirements for performing the disclosed functions, and it is understood that there are a variety of structures that can perform the same function that are related to the disclosed structures, and that these structures will typically achieve the same result.

B. Compositions

1. Biodegradation agent

[0045] Exemplary non-limiting biodegradation agents suitable for use as biodegradation agents in the methods, composition, materials, and gloves disclosed herein, their function, and use, are described in U.S. Published Application 2008/0103232 to Lake et al., which is hereby incorporated by reference in its entirety.

[0046] Biodegradation is generally considered as consisting of either enzyme-catalyzed hydrolysis, non-enzymatic hydrolysis, metabolic action, or both. The enzymes may be either endoenzymes which cleave the internal chain linkages within the chain or exoenzymes which cleave terminal monomer units sequentially.

[0047] Biodegradation is a functional decay of material, e.g. loss of strength, substance, transparency, or good dielectric properties where it is known to be identifiable with exposure of the material to a living environment, which may itself be very complex, and the property loss may be attributable to physical or chemical actions as first steps in an elaborate chain of processes.

[0048] A biodegradable polymer is a high molecular weight polymer that, owing to the action of micro- and/or macroorganisms or enzymes, degrades to lower molecular weight compounds. Natural polymers are by definition those which are biosynthesized by various routes in the biosphere. Proteins, polysaccharides, nucleic acids, lipids, natural rubber, and lignin, among others, are all biodegradable polymers, but the rate of this biodegradation may vary from hours to years depending on the nature of the functional group and degree of complexity. Biopolymers are organized in different ways at different scales. This hierarchical architecture of natural polymers allows the use of relatively few starting molecules (i.e. monomers), which are varied in sequences and conformations at molecular-, nano-, micro-, and macroscale, forming truly environmentally adaptable polymers.

[0049] On the other hand, the repetitive units of synthetic polymers are hydrolyzable, oxidizable, thermally degradable, or degradable by other means. Nature also uses these degradation modes, e.g., oxidation or hydrolysis, so in that sense there is no distinction between natural or synthetic polymers. The catalysts promoting the degradations in nature (catabolisms) are the enzymes, which are grouped in six different classes according to the reaction catalyzed. These classes include oxidoreductase for catalyzing redox reactions, transferase for catalyzing transfer of functional group reactions, hydrolase for catalyzing hydrolysis, lyase for catalyzing addition to double bond reactions, isomerase for catalyzing isomerization and ligase for catalyzing formation of new bonds using ATP.

[0050] Biodegradation of oxidizable polymers is generally slower than biodegradation of hydrolyzable ones. Even polyethylene, which is rather inert to direct biodegradation, has been shown to biodegrade after initial photo-oxidation. An oxidized polymer is more brittle and hydrophilic than a non-oxidized polymer, which also usually results in a material with increased biodegradability. Means to accelerate the oxidation of polymers (for example polyolefins) are presented according to one embodiment of the present invention.

[0051] For example, by combining a nickel dithiocarbamate (photo antioxidant) with an iron dithiocarbamate (photo proxidant), a wide range of embrittlement times may be obtained.

[0052] In one aspect, the materials and gloves disclosed herein provides for increased susceptibility to biodegradation of polymers by means of additives including a biopolymer. In this way a polymer blend is obtained that is more susceptible to biodegradation.

[0053] Combining granular starch mixed with polyethylene together with an unsaturated polymer, a thermal stabilizer, and a transition metal produce a material with increased susceptibility to photo-oxidation, thermolysis, and biodegradation. This particular material has also an induction time before degradation may be initiated. The use of starch alone in polyethylene, for example, requires, however, rather large amounts in order to really create an increase in the biodegradation rate.

[0054] According to one embodiment, a filler is added to a composition to be added to a polymer thereby increasing the biodegradability.

[0055] Microbial or enzymatic attack of pure aromatic polyester is increased by exposure to certain microbes, for example Trichosporum, athrobacteria and Asperyillus negs.

[0056] Aliphatic polyester degradation is seen as a two-step process: the first is depolymerization, or surface erosion. The second is enzymatic hydrolysis which produces water-insoluble intermediates that can be assimilated by microbial cells.

[0057] Polyurethane degradation may occur by fungal degradation, bacterial degradation and degradation by polyurethane enzymes.

[0058] In one aspect, the biodegradation agent can be a polymer, such as a biodegradable polymer. The polymers can be homo – or co-polymers. In one aspect, the polymer is a homopolymer. In another aspect, the polymer is a co-polymer. Co-polymers include AB and ABA type co-polymers. In one aspect, the polymer comprises polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[0059] In one aspect the polymer is polybutylene succinate. In one aspect, the polybutylene succinate can have a number average molecular mass (M_n) from 1,000 g/mole to 100,000 g/mole. In another aspect, the polybutylene succinate can have a number average molecular mass (M_n) from 5,000 g/mole to 80,000 g/mole. In yet another aspect, the polybutylene succinate can have a number average molecular mass (M_n) from 10,000 g/mole to 60,000 g/mole. In yet another aspect, the polybutylene succinate can have a number average molecular mass (M_n) from 20,000 g/mole to 60,000 g/mole. In yet another aspect, the polybutylene succinate can have a number average molecular mass (M_n) from 30,000 g/mole to 50,000 g/mole. In one aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 1,000 g/mole to 150,000 g/mole. In another aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 5,000 g/mole to 100,000 g/mole. In yet another aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 10,000 g/mole to 80,000 g/mole. In yet another aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 20,000 g/mole to 80,000 g/mole. In yet another aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 30,000 g/mole to 80,000 g/mole. In yet another aspect, the polybutylene succinate can have a weight average molecular mass (M_w) from 50,000 g/mole to 70,000 g/mole. In one aspect, the polybutylene succinate can have a Z average molecular mass (M_z) from 1,000 g/mole to 300,000 g/mole. In another aspect, the polybutylene succinate can have a Z average molecular mass (M_z) from 30,000 g/mole to 250,000 g/mole. In yet another aspect, the polybutylene succinate can have a Z average molecular mass (M_z) from 50,000 g/mole to 200,000 g/mole. In yet another aspect, the polybutylene succinate can have a Z average molecular mass (M_z) from 100,000 g/mole to 200,000 g/mole. In yet another aspect, the polybutylene succinate can have a Z average molecular mass (M_z) from 130,000 g/mole to 180,000 g/mole. In one aspect, the polybutylene succinate can have a polydispersity index PDI from 1.1 to 5.0. In another aspect, the polybutylene succinate can have a polydispersity index PDI from 1.2 to 3.0. In yet another aspect, the polybutylene succinate can have a polydispersity index PDI from 1.2 to 2.0. In yet another aspect, the polybutylene succinate can have a polydispersity index PDI from 1.3 to 1.8. In yet another aspect, the polybutylene succinate can have a polydispersity index PDI from 1.4 to 1.7.

[0060] In one aspect, the polymer can have a number average molecular mass (M_n) from 1,000 g/mole to 100,000 g/mole. In another aspect, the polymer can have a number average molecular mass (M_n) from 5,000 g/mole to 80,000 g/mole. In yet another aspect, the polymer can have a number average molecular mass (M_n) from 10,000 g/mole to 60,000 g/mole. In yet another aspect, the polymer can have a number average molecular mass (M_n) from 20,000 g/mole to 60,000 g/mole. In yet another aspect, the polymer can have a number average molecular mass (M_n) from 30,000 g/mole to 50,000 g/mole. In one aspect, the polymer can have a weight average molecular mass (M_w) from 1,000 g/mole to 150,000 g/mole. In another aspect, the polymer can have a weight average molecular mass (M_w) from 5,000 g/mole to 100,000 g/mole. In yet another aspect, the polymer can have a weight average molecular mass (M_w) from 10,000 g/mole to 80,000 g/mole. In yet another aspect, the polymer can have a weight average molecular mass (M_w) from 20,000 g/mole to 80,000 g/mole. In yet another aspect, the polymer can have a weight average molecular mass (M_w) from 30,000 g/mole to 80,000 g/mole. In yet another aspect, the polymer can have a weight average molecular mass (M_w) from 50,000 g/mole to 70,000 g/mole. In one aspect, the polymer can have a Z average molecular mass (M_z) from 1,000 g/mole to 300,000 g/mole. In another aspect, the polymer can have a Z average molecular mass (M_z) from 30,000 g/mole to 250,000 g/mole. In yet another aspect, the polymer can have a Z average molecular mass (M_z) from 50,000 g/mole to 200,000 g/mole. In yet another aspect, the polymer can have a Z average molecular mass (M_z) from 100,000 g/mole to 200,000 g/mole. In yet another aspect, the polymer can have a Z average molecular mass (M_z) from 130,000 g/mole to 180,000 g/mole. In one aspect, the polymer can have a polydispersity index PDI from 1.1 to 5.0. In another aspect, the polymer can have a polydispersity index PDI from 1.2 to 3.0. In yet another aspect, the polymer can have a polydispersity index PDI from 1.2 to 2.0. In yet another aspect, the polymer can have a polydispersity index PDI from 1.3 to 1.8. In yet another aspect, the polymer can have a polydispersity index PDI from 1.4 to 1.7.

[0061] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[0062] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the acrylonitrile butadiene based rubber.

[0063] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[0064] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[0065] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[0066] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarin and/or coumarin derivatives.

[0067] Without being bound by theory, it is believed that the biodegradation agent enhances the biodegradability of otherwise non-biodegradable plastic products through a series of chemical and biological processes when disposed of in a microbe-rich environment, such as a biologically active landfill. The biodegradation agent causes the plastic to be an attractive food source to certain soil microbes, encouraging the plastic to be consumed more quickly than plastics without the biodegradation agent.

[0068] The biodegradation agent requires the action of certain enzymes for the biodegradation process to begin, so plastics containing the biodegradation agent will not start to biodegrade during the intended use of the materials and gloves described herein. For example, the microbes can secrete enzymes that break down the polymers into components that are easily consumed by microbes. Typically, when an organic material biodegrades in an anaerobic environment, the by-products are: humus, methane and carbon dioxide. It is believed that when plastics containing the biodegradation agent are biodegraded to the same by-products as an organic material.

2. Microbes

[0069] A variety of microorganisms, including bacteria and fungi, aid in degrading polymeric materials. Preliminary Review of the Degradation of Cellulosic, Plastic, and Rubber Materials in the Waste Isolation Pilot Plant, and Possible Effects of Magnesium Oxide Safety Factor Calculations, Prepared for U.S. EPA Office of Radiation and Indoor Air (Sep. 11, 2006). Actinobacteria are a type of bacteria that are most(ly) commonly found in soil and can thrive in low-nutrient environments. They can survive in both aerobic and anaerobic conditions, although most are aerobic. The most important role of the Actinobacteria is decomposition of organic nutrients, such as cellulose, and they are one of the few bacteria able to consume lignocellulose.

[0070] Fungi (molds) commonly require oxygen and a pH range of 4.5 to 5 to proliferate. Fungi grow at temperatures ranging up to 45 °C, although optimum growth rates generally occur at temperatures between 30 °C and 37 °C. Because most fungi require oxygen, they may only be available for cellulosic, plastic and rubber (CPR) degradation before closure and for a relatively short time (compost environment). There is some evidence that anaerobic fungi may degrade lignocellulosic materials.

[0071] Biodegradation processes can affect polymers in a number of ways. Microbial processes that can affect polymers include mechanical damage caused by growing cells, direct enzymatic effects leading to breakdown of the polymer structure, and secondary biochemical effects caused by excretion of substances other than enzymes that may directly affect the polymer or change environmental conditions, such as pH or redox conditions. Although microorganisms such as bacteria generally are very specific with respect to the substrate utilized for growth, many are capable of adapting to other substrates over time. Microorganisms produce enzymes that catalyze reactions by combining with a specific substrate or combination of substrates. The conformation of these enzymes determines their catalytic reactivity towards polymers. Conformational changes in these enzymes may be induced by the changes in pH, temperature, and other chemical additives.

3. Microbes and Plastics Degradation

[0072] For the enzymatic degradation of synthetic plastic and rubber polymers, polymers containing hydrolysable groups in the polymer backbone would be especially prone to microbial attack, because many microorganisms are capable of producing hydrolases (enzymes catalyzing hydrolysis). In general, aliphatic polyesters, polyurethane, polyethers, and polyimides are more easily degraded by commonly occurring microorganisms. Generally, higher molecular weight polymers and branched polymers are more resistant to microbial degradation. However, some bacterial strains have been identified that can degrade polyethylene, including Rhodococcus and B. borstelensis.

[0073] The ability of microorganisms to adapt to a new source of nutrients is highly noteworthy in any evaluation of the microbial degradation of plastic and rubber materials. Evidence of adaptation of bacteria for the degradation of plastics has been shown in several cases. For example, it was found that Pseudomonas aeruginosa started proliferation 56 days after the bacteria were brought into contact with polyamide-6 polymer. Inoculation of previously untreated polyamide with these bacteria resulted in immediate growth on the new substrate. Individual species of bacteria can carry out several different steps of chemical breakdown or biodegradation. Most toxic compounds are degraded or biodegraded by groups called consortia. Each species in the group works on a particular stage of the degradation process, and one or more of them together are needed for the complete degradation or biodegradation or detoxification process. Contaminated vessels containing such things as pesticides, metals, radioactive elements, mixed wastes and the like can be made to contain microbes that will detoxify and decompose the contaminates and biodegrade the vessel.

[0074] Other microbes that may assist in biodegradation are psychrophiles, mesophiles, thermophiles, actinomycetes, saprophytes, absidia, acremonium, alternaria, amerospore, arthrinium, ascospore, aspergillus, aspergillus caesiellus, aspergillus candidus, aspergillus carneus, aspergillus clavatus, aspergillus deflectus, aspergillus flavus, aspergillus fumigatus, aspergillus glaucus, aspergillus nidulans, aspergillus ochraceus, aspergillus oryzae, aspergillus parasiticus, aspergillus penicilloides, aspergillus restrictus, aspergillus sydowi, aspergillus terreus, aspergillus ustus, aspergillus versicolor, aspergillus/penicillium--like, aureobasidium, basidiomycetes, basidiospore, bipolaris, blastomyces, B. borstelensis, botrytis, candida, cephalosporium, chaetomium, cladosporium, cladosporium fulvum, cladosporium herbarum, cladosporium macrocarpum, cladosporium sphaerospermum, conidia, conidium, conidobolus, Cryptococcus neoformans, cryptostroma corticale, cunninghamella, curvularia, dreschlera, epicoccum, epidermophyton, fungus, fusarium, fusarium solani, geotrichum, gliocladium, helicomyces, helminthosporium, histoplasma, humicula, hyaline mycelia, memnoniella, microsporum, mold, monilia, mucor, mycelium, myxomycetes, nigrospora, oidium, paecilomyces, papulospora, penicillium, periconia, perithecium, peronospora, phaeohyphomycosis, phoma, pithomyces, rhizomucor, rhizopus, rhodococcus, rhodotorula, rusts, saccharomyces, scopulariopsis, sepedonium, serpula lacrymans, smuts, spegazzinia, spore, sporoschisma, sporothrix, sporotrichum, stachybotrys, stemphylium, syncephalastrum, Thermononespore fusca DSM43793, torula, trichocladium, trichoderma, trichophyton, trichothecium, tritirachium, ulocladium, verticillium, wallemia and yeast.

[0075] One or several furanone compounds combined can act as chemo attractants for bacteria and or as odorants for the decomposing or degrading polymer. Some furanones, particularly certain halogenated furanones are quorum sensing inhibitors. Quorum sensing inhibitors are typically low-molecular-mass molecules that cause significant reduction in quorum sensing microbes. In other words, halogenated furanones kill certain microbes. Halogenated furanones prevent bacterial colonization in bacteria such as V. fischeri, Vibrio harveyi, Serratia ficaria and other bacteria. However, the natural furanones are ineffective against P. aeruginosa, but synthetic furanones can be effective against P. aeruginosa.

[0076] Some furanones, including but not limited to those listed below, can be chemo attractant agents for bacteria. Suitable furanones include but are not limited to: 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones, or a combination thereof.

[0077] Bacteria that have shown to attract to the furanone compounds listed above include, but are not limited to C. violaceum.

[0078] Other chemo attractant agents include sugars that are not metabolized by the bacteria. Examples of these chemo attractant agents may include but are not limited to: galactose, galactonate, glucose, succinate, malate, aspartate, serine, fumarate, ribose, pyruvate, oxalacetate and other L-sugar structures and D-sugar structures but not limited thereto. Examples of bacteria attracted to these sugars include, but are not limited to Escherichia coli, and Salmonella. In a preferred embodiment the sugar is a non-estererfied starch.

[0079] Coumarin and its derivatives can also be chemo attractant agents for bacteria. Coumarin derivatives are known to those skilled in the art.

[0080] In one aspect, the biodegradation agents can be combined with any polymeric material, such a polymeric material found in gloves, such as acrylonitrile butadiene based rubber, a halogen containing elastomeric polymer, or a halogen containing thermoplastic polymer. When combined in small quantities with any of acrylonitrile butadiene based rubber, a halogen containing elastomeric polymer, and a halogen containing thermoplastic polymer, the resulting compositions, materials or gloves become biodegradable while maintaining their desired characteristics. The resulting materials and products (i.e. gloves) made therefrom exhibit the same desired mechanical properties, and have effectively similar shelf-lives as products without the additive, and yet, when disposed of, are able to at least partially metabolize into inert biomass by the communities of anaerobic and aerobic microorganisms commonly found almost everywhere on Earth.

[0081] This biodegradation process can take place aerobically or anerobically. It can take place with or without the presence of light. Traditional polymers and products therefrom are now able to biodegrade in land fill and compost environments within a reasonable amount of time as defined by the EPA to be 30 to 50 years on average.

[0082] In one aspect, the biodegradation agents can increase, when added, the biodegradation rate of the disclosed materials and gloves. The materials and gloves can be degraded into an inert humus-like form that is harmless to the environment. An example of attracting microorganisms through chemotaxis is to use a positive chemotaxis, such as a scented polyethylene terephthalate pellet, starch D-sugars not metabolized by the microbes or furanone that attracts microbes or any combination thereof.

[0083] In one aspect, the biodegradation process begins with one or more proprietary swelling agents that, when combined with heat and moisture, expands the plastics' molecular structure.

[0084] After the one or more swelling agents create space within the plastic's molecular structure, the combination of bio-active compounds discovered after significant laboratory trials attracts a colony of microorganisms that break down the chemical bonds and metabolize the plastic through natural microbial processes.

[0085] In one aspect, the biodegradation agent comprises a furanone compound, a glutaric acid, a hexadecanoic acid compound, a polycaprolactone polymer, a carrier resin to assist with placing the additive material into the polymeric material in an even fashion to assure proper biodegradation. The biodegradation agent can also comprise organoleptic organic chemicals as swelling agents i.e. natural fibers, cultured colloids, cyclo-dextrin, polylactic acid, etc.

[0086] In one aspect, a biodegradation agent can comprise a mixture of a furanone compound, a glutaric acid, a hexadecanoic acid compound, a polycaprolactone polymer, organoleptic swelling agent (natural fiber, cultured colloid, cyclo-dextri, polylactic acid, etc.) and a carrier resin to assist with placing the additive material into the polymeric material to be rendered biodegradable in an even fashion to assure proper biodegradation. In one aspect, the furanone compound is in a range equal to or greater than 0-20% by weight. In another aspect, the furanone compound is 20-40% by weight, or 40-60% by weight, or 60-80% by weight or 80-100% by weight of the total additive. The glutaric acid is in the range equal to or greater than 0-20% by weight of the total additive. In another aspect, the glutaric acid is 20-40% by weight, or 40-60% by weight, or 60-80% by weight or 80-100% by weight, 20-40%, 40-60%, 60-80% or 80-100% by weight of the total additive. The hexadecanoic acid compound is in the range equal to or greater than 0-20% by weight of the total additive. In another aspect, the hexadecanoic acid is 20-40% by weight, or 40-60% by weight, or 60-80% by weight or 80-100% by weight, 20-40%, 40-60%, 60-80% or 80-100% by weight of the total additive. The polycaprolactone polymer is in the range equal to or greater than 0-20% by weight of the total additive. In another aspect, the polycaprolactone is 20-40% by weight, or 40-60% by weight, or 60-80% by weight or 80-100% by weight, 20-40%, 40-60%, 60-80% or 80-100% by weight of the total biodegradation agent. The natural or manmade organoleptic swelling agent (e.g. natural fiber, cultured colloid, cyclo-dextrin, or polylactic acid) is in the range equal to or greater than 0-20% by weight of the additive. In one aspect, the organoleptic swelling agent is 20-40% by weight, or 40-60% by weight, or 60-80% by weight or 80-100% by weight, 20-40%, 40-60%, 60-80% or 80-100% by weight of the total biodegradation agent.

[0087] In one aspect, the glutaric acid compound can be propylglutaric acid for example, but is not limited thereto.

[0088] In one aspect, the polycaprolactone polymer can be selected from, but is not limited to the group of: poly-ε-caprolactone, polycaprolactone, poly(lactic acid), poly(glycolic acid), poly (lactic_co_glycolic acid).

[0089] In one aspect, the swelling agents may be selected from, but is not limited to the group of: natural fibers, cultured colloids, organoleptic compounds, cyclo-dextrin.

[0090] In one aspect, he carrier resin can be selected from, but is not limited to the group of: ethylene vinyl acetate, poly vinyl acetate, maleic anhydride, and acrylic acid with polyolefins.

[0091] In one aspect, the biodegradation agent can further comprise dipropylene glycol.

[0092] In one aspect, the biodegradation agent can further comprise soy derivatives, such as soy-methyl-ester.

[0093] In one aspect, biodegradation agent can be incorporated in the polymers described herein by, for example, granulation, powdering, making an emulsion, suspension, or other medium of similar even consistency.

[0094] In one aspect, the biodegradation agent is blended into the polymeric material just before sending the polymeric material to the forming machinery for making the gloves.

[0095] Any carrier resin may be used (such as poly-vinyl acetate, ethyl vinyl acetate, etc.) where poly olefins or any plastic material that these carrier resins are compatible with can be combined chemically and allow for the dispersion of the additive.

[0096] In one aspect, the biodegradation agent comprises one or more antioxidants that are used to control the biodegradation rate. Antioxidants can be enzymatically coupled to biodegradable monomers such that the resulting biodegradable polymer retains antioxidant function. Antioxidant-couple biodegradable polymers can be produced to result in the antioxidant coupled polymer degrading at a rate consistent with an effective administration rate of the antioxidant. Antioxidants are chosen based upon the specific application, and the biodegradable monomers may be either synthetic or natural.

[0097] In one aspect, an exemplary biodegradation agent can comprise the organic lipid based SR5300 product available from ENSO Plastics of Mesa, Arizona.

4. MATERIALS

a. BIODEGRADABLE ELASTOMERIC MATERIAL

i. Materials Comprising Acrylonitrile

[0098] Disclosed herein is a biodegradable elastomeric material formed from a composition comprising: a) an acrylonitrile butadiene based rubber; b) an alkali stabilizing agent; c) a metal oxide crosslinking agent; and d) a biodegradation agent, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[0099] In one aspect, the acrylonitrile butadiene based rubber is present in an amount of from greater than 70.0 to about 98.0 parts per 100 dry parts of the total composition. For example, the acrylonitrile butadiene based rubber is present in an amount of about 72.0, 76.0, 80.0, 84.0, 88.0, 92.0 or 96.0 parts per 100 dry parts of the total composition. For example, the acrylonitrile butadiene based rubber is present in an amount of about 88.0 parts per 100 dry parts of the total composition. Acrylonitrile butadiene based rubbers and latex are known to those skilled in the art and is available in the market place. For example, an acrylonitrile butadiene based latex is available from Synthomer as Synthomer X1138, which is a fine dispersion of the carboxylated acrylonitrile butadiene rubber particles in water (45% solids/55% water).

[00100] In one aspect, the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the alkali stabilizing agent is present in an amount of about 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8 or 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00101] In one aspect, the alkali stabilizer comprises an alkali hydroxide. Suitable alkali stabilizers include, but are not limited to, those comprising potassium hydroxide or ammonia, or a combination thereof. For example, the alkali stabilizer can be potassium hydroxide. In another example, the alkali stabilizer can be ammonia. In yet another example, the alkali stabilizer can be potassium hydroxide and ammonia.

[00102] In one aspect, the composition can have a basic pH. For example, composition can have a pH in the range of from about 8.0 to about 12.0, such as for example, 8.5 to about 10.5.

[00103] In one aspect, the acrylonitrile butadiene based rubber can be an acrylonitrile butadiene rubber latex. In another example, the acrylonitrile butadiene based rubber can be a carboxylated acrylonitrile butadiene rubber latex.

[00104] In one aspect, the metal oxide crosslinking agent can be zinc oxide or magnesium oxide. For example, the metal oxide crosslinking agent can be zinc oxide. In another example, the metal oxide crosslinking agent can be magnesium oxide. Other metal oxide crosslinking agent can also be other substances known in the art.

[00105] In one aspect, the metal oxide crosslinking agent can be present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the metal oxide crosslinking agent can be present in an amount of about 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5 or 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00106] In one aspect, the composition can further comprise at least one additive. Suitable additives can be selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

[00107] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00108] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the biodegradation agent is present in the composition in an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 or 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00109] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00110] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00111] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00112] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00113] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00114] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarin and/or coumarin derivatives.

[00115] In one aspect, the elastomeric material can be vulcanized. In another aspect, the elastomeric material is not vulcanized. For example, the composition would not contain any accelerator material.

[00116] In one aspect, the composition or elastomeric material can further comprise a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber. Suitable carboxylic acids include, but are not limited to carboxylic acid is ethylene acrylic acid.

[00117] Crosslinking chemistries that can be incorporated to all disclosed materials and gloves described herein is described in U.S. patent 6,706,816 to Williams et al., which is hereby incorporated by references by its entirety.

[00118] In one aspect, the biodegradable elastomeric material is unsupported. In another aspect, the biodegradable elastomeric material is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (for example, Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

ii. MATERIALS COMPRISING A HALOGEN CONTAINING ELASTOMERIC POLYMER

[00119] Also disclosed herein is biodegradable elastomeric material, formed from a composition comprising: a) a halogen containing elastomeric polymer; and b) a biodegradation agent, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[00120] In one aspect, the halogen containing elastomeric polymer is present in an amount of from greater than 70.0 to about 98.0 parts per 100 dry parts of the total composition. For example, the halogen containing elastomeric polymer is present in an amount of about 72.0, 76.0, 80.0, 84.0, 88.0, 92.0 or 96.0 parts per 100 dry parts of the total composition. For example, the halogen containing elastomeric polymer is present in an amount of about 88.0 parts per 100 dry parts of the total composition. Polychloroprene is known to those skilled in the art and is available in the market place. For example, polychloroprene is available from DuPont™ as Neoprene.

[00121] In one aspect, the halogen containing elastomeric polymer comprisespolychloroprene. For example, the halogen containing elastomeric polymer can be polychloroprene.

[00122] In one aspect, the composition can further comprise a metal oxide cross linking agent. In one aspect, the metal oxide crosslinking agent can be zinc oxide or magnesium oxide. For example, the metal oxide crosslinking agent can be zinc oxide. In another example, the metal oxide crosslinking agent can be magnesium oxide. Other metal oxide crosslinking agent can also be other substances known in the art.

[00123] In one aspect, the metal oxide crosslinking agent can be present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the metal oxide crosslinking agent can be present in an amount of about 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0 or 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00124] In one aspect, the composition can further comprise at least one additive. Suitable additives can be selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

[00125] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00126] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the biodegradation agent is present in the composition in an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, or 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00127] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00128] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the halogen containing elastomeric polymer.

[00129] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters,

polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00130] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00131] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00132] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarine and/or coumarin derivatives.

[00133] In one aspect, the elastomeric material can be vulcanized. In another aspect, the elastomeric material is not vulcanized. For example, the composition would not contain any accelerator material.

[00134] In one aspect, the composition or elastomeric material can further comprise a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber. Suitable carboxylic acids include, but are not limited to carboxylic acid is ethylene acrylic acid.

[00135] In one aspect, the biodegradable elastomeric material is unsupported. In another aspect, the biodegradable elastomeric material is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (for example, Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

b. BIODEGRADABLE THERMOPLASTIC MATERIAL

[00136] Also disclosed herein is a biodegradable thermoplastic material, formed from a composition comprising: a) a halogen containing thermoplastic polymer; b) a biodegradation agent; and c) a plasticizer, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic material in the absence of the biodegradation agent.

[00137] In one aspect, the halogen containing thermoplastic polymer is present in an amount of from greater than 30.0 to about 70.0 parts per 100 dry parts of the total composition. For example, the halogen containing thermoplastic polymer is present in an amount of about 35.0, 40.0, 45.0, 50.0, 55.0, 60.0, 65.0 parts per 100 dry parts of the total composition. For example, the halogen containing thermoplastic polymer is present in an amount of about 50.0 parts per 100 dry parts of the total composition. Halogen containing thermoplastic polymer are known to those in skilled in the art and is available in the market place. For example, polyvinyl chloride (PVC) is available from Cameo Chemicals as Pevikon 737.

[00138] In one aspect, the halogen containing thermoplastic polymer can comprise polyvinyl chloride (PVC). For example, the halogen containing thermoplastic polymer can be PVC.

[00139] The plasticizer provides a number of functions, including wetting of a surface, or alternately, decreasing the elastic modulus of the material, or further still, aiding in the mixing and application of the material. Numerous plasticizers exist and are known in the art, including fatty acids, e.g., oleic acid, palmitic acid, etc., dioctylphthalate, phospholipids, and phosphatidic acid. Suitable plasticizers include, but are not limited to Di-isononyl Phthalate, 1-[2-(benzoyloxy)propoxy] propan-2-yl benzoate, and epoxidized soybean oil. The plasticizer can be present in an amount of from greater than 0 to about 160 parts per 100 dry parts of the halogen containing thermoplastic polymer. For example, the plasticizer can be present in an amount of about 20, 40, 60, 80, 100, 120, 140 or 160 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00140] In one aspect, the composition further comprises at least one additive selected from the group consisting of a filler, stabilizer and pigment.

[00141] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00142] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the biodegradation agent is present in the composition in an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, or 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00143] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00144] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the halogen containing elastomeric polymer.

[00145] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00146] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00147] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00148] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarine and/or coumarin derivatives.

[00149] In one aspect, the biodegradable thermoplastic material is unsupported. In another aspect, the biodegradable thermoplastic material is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

c. BIODEGRADABILITY PROPERTIES OF THE MATERIALS

[00150] All the properties described herein can be attributed to all materials disclosed herein, including the biodegradable elastomeric materials and the biodegradable thermoplastic materials.

[00151] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material is biodegradable under aerobic conditions. In another aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material biodegradable under anaerobic conditions.

[00152] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

[00153] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

[00154] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM

D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

[00155] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

[00156] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

[00157] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%.

[00158] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00159] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00160] In one aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

C. GLOVES

1. BIODEGRADABLE ELASTOMERIC GLOVES

a. GLOVES COMPRISING ACRYLONITRILE

[00161] Also disclosed herein is a biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising: a) an acrylonitrile butadiene based rubber; b) an alkali stabilizing agent; c) a metal oxide crosslinking agent; and d) a biodegradation agent, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00162] In one aspect, the acrylonitrile butadiene based rubber is present in an amount of from greater than 70.0 to about 98.0 parts per 100 dry parts of the total composition. For example, the acrylonitrile butadiene based rubber is present in an amount of about 72.0, 76.0, 80.0, 84.0, 88.0, 92.0, or 96.0 parts per 100 dry parts of the total composition. For example, the acrylonitrile butadiene based rubber is present in an amount of about 88.0 parts per 100 dry parts of the total composition.

[00163] In one aspect, the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the alkali stabilizing agent is present in an amount of about 0.2, 0.4, 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8 or 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00164] In one aspect, the alkali stabilizer comprises an alkali hydroxide. Suitable alkali stabilizers include, but are not limited to, those comprising potassium hydroxide or ammonia. For example, the alkali stabilizer can be potassium hydroxide. In another example, the alkali stabilizer can be ammonia.

[00165] In one aspect, the composition can have a basic pH. For example, composition can have a pH in the range of from about 8.0 to about 12.0, such as for example, 8.5 to about 10.5.

[00166] In one aspect, the acrylonitrile butadiene based rubber can be an acrylonitrile butadiene rubber latex. In another example, the acrylonitrile butadiene based rubber can be a carboxylated acrylonitrile butadiene rubber latex.

[00167] In one aspect, the metal oxide crosslinking agent can be zinc oxide or magnesium oxide. For example, the metal oxide crosslinking agent can be zinc oxide. In another example, the metal oxide crosslinking agent can be magnesium oxide. Other metal oxide crosslinking agent can also be other substances known in the art.

[00168] In one aspect, the metal oxide crosslinking agent can be present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the metal oxide crosslinking agent can be present in an amount of about 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, or 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00169] In one aspect, the composition can further comprise at least one additive. Suitable additives can be selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, in organic filler, antioxidant, pigment, and odorant.

[00170] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00171] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber. For example, the biodegradation agent is present in the composition in an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, or 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00172] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00173] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00174] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00175] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00176] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00177] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarine and/or coumarin derivatives.

[00178] In one aspect, the elastomeric material can be vulcanized. In another aspect, the elastomeric material is not vulcanized. For example, the composition would not contain any accelerator material.

[00179] In one aspect, the composition or elastomeric material can further comprise a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber. Suitable carboxylic acids include, but are not limited to carboxylic acid is ethylene acrylic acid.

[00180] Crosslinking chemistries that can be incorporated to all disclosed materials and gloves described herein is described in U.S. patent 6,706,816 to Williams et al., which is hereby incorporated by references by its entirety.

[00181] In one aspect, the biodegradable elastomeric glove is unsupported. In another aspect, the biodegradable elastomeric glove is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (for example, Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

(b) GLOVES COMPRISING A HALOGEN CONTAINING ELASTOMERIC POLYMER

[00182] A biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising: a) a halogen containing elastomeric polymer; and b) a biodegradation agent, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00183] In one aspect, the halogen containing elastomeric polymer is present in an amount of from greater than 70.0 to about 98.0 parts per 100 dry parts of the total composition. For example, the halogen containing elastomeric polymer is present in an amount of about 72.0, 76.0, 80.0, 84.0, 88.0, 92.0, or 96.0 parts per 100 dry parts of the total composition. For example, the halogen containing elastomeric polymer is present in an amount of about 88.0 parts per 100 dry parts of the total composition.

[00184] In one aspect, the halogen containing elastomeric polymer comprises comprising polychloroprene. For example, the halogen containing elastomeric polymer can be polychloroprene.

[00185] In one aspect, the composition can further comprise a metal oxide cross linking agent. In one aspect, the metal oxide crosslinking agent can be zinc oxide or magnesium oxide. For example, the metal oxide crosslinking agent can be zinc oxide. In another example, the metal oxide crosslinking agent can be magnesium oxide. Other metal oxide crosslinking agent can also be other substances known in the art.

[00186] In one aspect, the metal oxide crosslinking agent can be present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing

elastomeric polymer. For example, the metal oxide crosslinking agent can be present in an amount of about 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, 7.0, 8.0, 9.0 or 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00187] In one aspect, the composition can further comprise at least one additive. Suitable additives can be selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, in organic filler, antioxidant, pigment, and odorant.

[00188] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00189] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the biodegradation agent is present in the composition in an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 or 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00190] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00191] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the halogen containing elastomeric polymer.

[00192] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00193] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00194] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00195] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarine and/or coumarin derivatives.

[00196] In one aspect, the elastomeric material can be vulcanized. In another aspect, the elastomeric material is not vulcanized. For example, the composition would not contain any accelerator material.

[00197] In one aspect, the composition or elastomeric material can further comprise a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber. Suitable carboxylic acids include, but are not limited to carboxylic acid is ethylene acrylic acid.

[00198] In one aspect, the biodegradable elastomeric glove is unsupported. In another aspect, the biodegradable elastomeric glove is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

2. BIODEGRADABLE THERMOPLASTIC GLOVE

[00199] Also disclosed herein is a biodegradable thermoplastic glove, comprising a biodegradable thermoplastic glove material formed from a composition comprising: a) a halogen containing thermoplastic polymer comprising polyvinyl chloride; and b) a biodegradation agent, wherein the biodegradable thermoplastic glove material exhibits a

biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00200] In one aspect, the halogen containing thermoplastic polymer is present in an amount of from greater than 30.0 to about 70.0 parts per 100 dry parts of the total composition. For example, the halogen containing thermoplastic polymer is present in an amount of about 35.0, 40.0, 45.0, 50.0, 55.0, 60.0 or 65.0 parts per 100 dry parts of the total composition. For example, the halogen containing thermoplastic polymer is present in an amount of about 50.0 parts per 100 dry parts of the total composition.

[00201] In one aspect, the composition further comprises a plasticizer. Numerous plasticizers exist and are known in the art, including fatty acids, e.g., oleic acid, palmitic acid, etc., dioctylphtalate, phospholipids, and phosphatidic acid. Suitable plasticizers include, but are not limited to Di-isononyl Phthalate, 1-[2-(benzoyloxy)propoxy] propan-2-yl benzoate, and epoxidized soybean oil. The plasticizer can be present in an amount of from greater than 0 to about 160.0 parts per 100 dry parts of the halogen containing thermoplastic polymer. For example, the plasticizer can be present in an amount of about 20, 40, 60, 80, 100, 120, 140 or 160 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00202] In one aspect, the halogen containing thermoplastic polymer can comprise polyvinyl chloride (PVC). For example, the halogen containing thermoplastic polymer can be PVC.

[00203] In one aspect, the composition further comprises at least one additive selected from the group consisting of an inorganic filler, stabilizer and pigment.

[00204] In one aspect, the composition can comprise an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the composition can comprise an inorganic filler present in an amount of about 2, 4, 6, 8, 10, 12, 14, 16, 18 or 20 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00205] In one aspect, the biodegradation agent is present in the composition in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer. For example, the biodegradation agent is present in the composition in

an amount of about 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9 or 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00206] In one aspect, the biodegradation agent can comprise a carboxylic acid compound. In another aspect, the biodegradation agent can comprise a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00207] In one aspect, the biodegradation agent can further comprise a microbe capable of digesting the halogen containing elastomeric polymer.

[00208] In one aspect, the polymer can comprised in the biodegradation agent can selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers, or a combination thereof.

[00209] In one aspect, the biodegradation agent can further comprise a compatibilizing additive.

[00210] In one aspect, the biodegradation agent can further comprise a carrier resin. Suitable carrier resins include, but are not limited to, polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00211] In one aspect, the biodegradation agent can further comprise a chemotaxis agent to attract microbes. Suitable chemotaxis agents comprise, but are not limited to, a sugar or a furanone. In one aspect, the furanone can be selected from 3,5 dimethylyentenyl dihydro 2(3H)furanone isomer mixtures, emoxyfurane and N-acylhomoserine lactones. In another aspect, the chemotaxis agent can comprise coumarine and/or coumarin derivatives.

[00212] In one aspect, the biodegradable thermoplastic glove is unsupported. In another aspect, the biodegradable thermoplastic glove is supported. Suitable support materials include, but are not limited to cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids

(Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

3. BIODEGRADABILITY PROPERTIES OF THE GLOVES

[00213] All the properties described herein can be attributed to all gloves disclosed herein, including the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves.

[00214] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves is biodegradable under aerobic conditions. In another aspect, the biodegradable elastomeric material or the biodegradable thermoplastic material biodegradable under anaerobic conditions.

[00215] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

[00216] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

[00217] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

[00218] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

[00219] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%.

[00220] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00221] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00222] In one aspect, the biodegradable elastomeric gloves and the biodegradable thermoplastic gloves exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

D. METHODS

[00223] Also disclosed herein are methods of how to make the gloves described herein. All compositions and materials described herein can be used in the disclosed methods and have the same properties as disclosed elsewhere herein. For example, if a method requires a composition comprising a halogen containing thermoplastic polymer comprising polyvinyl chloride, and a biodegradation agent, it is also understood that the composition can further comprise other substances and compounds as described elsewhere herein.

[00224] Methods for how to produce unsupported acrylonitrile butadiene based rubber gloves are described in U.S. Patent RE35,616 to Tillotson, which is hereby incorporated by its entirety by reference.

1. Methods to produce biodegradable elastomeric gloves

A. Unsupported gloves

[00225] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape; b) contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former; c) drying the coagulant coating; d) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. an acrylonitrile butadiene based rubber; ii an alkali stabilizing agent; iii a metal oxide crosslinking agent; and iv. a biodegradation agent, e)curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00226] In one aspect, the method can further comprise before step e) beading a portion of the coating.

[00227] In one aspect, the method can further comprise removing the elastomeric glove material from the glove former.

[00228] In one aspect, the glove former can be pre-heated.

[00229] In one aspect, the method can further comprise before and/or after step e) the step of leaching to remove coagulant. For example, the method can further comprise before step e) the step of leaching to remove coagulant. In another example, the method can further comprise after step e) the step of leaching to remove coagulant. In yet another example, the method can further comprise before and after step e) the step of leaching to remove coagulant.

[00230] In one aspect, the method can further comprises after leaching to remove the coagulant beading a portion of the coating.

[00231] In one aspect, the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

[00232] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape; b) contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former; c) drying the coagulant coating; d) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. a halogen containing elastomeric polymer comprising polychloroprene, and ii. a biodegradation agent, e) curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00233] In one aspect, the method can further comprise before step e) beading a portion of the coating.

[00234] In one aspect, the method can further comprise removing the elastomeric glove material from the glove former.

[00235] In one aspect, the glove former can be pre-heated.

[00236] In one aspect, the method can further comprise before and/or after step e) the step of leaching to remove coagulant. For example, the method can further comprise before step e) the step of leaching to remove coagulant. In another example, the method can further comprise after step e) the step of leaching to remove coagulant. In yet another example, the method can further comprise before and after step e) the step of leaching to remove coagulant.

[00237] In one aspect, the method can further comprise beading a portion of the coating. This beading step can occur after the step of leaching to remove the coagulant.

[00238] In one aspect, the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

B. Supported Gloves

[00239] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. an acrylonitrile butadiene based rubber; ii. an alkali stabilizing agent; iii. a metal oxide crosslinking agent; and iv. a biodegradation agent, to provide a first coating of the composition on the support material; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00240] In one aspect, the method further comprises at least partially coating a coagulant on the first coating. In one aspect, the at least partially coating a coagulant on the first coating can be applied before step b). In another aspect, the at least partially coating a coagulant on the first coating can be applied after step b). In yet another aspect, the at least partially coating a coagulant on the first coating can be applied before and after step b).

[00241] In one aspect, the glove former can be pre-heated.

[00242] In one aspect, the method further comprises removing the supported elastomeric glove material from the glove former.

[00243] In one aspect, the method further comprises leaching after step d).

[00244] In one aspect, the method further comprises after step d) curing the composition.

[00245] Suitable support materials include, but are not limited to the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00246] Also disclosed herein is a method for producing a biodegradable elastomeric glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. halogen containing elastomeric polymer comprising polychloroprene; and a biodegradation agent; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00247] In one aspect, the method further comprises at least partially coating a coagulant on the first coating. In one aspect, the at least partially coating a coagulant on the first coating can be applied before step b). In another aspect, the at least partially coating a coagulant on the first coating can be applied after step b). In yet another aspect, the at least partially coating a coagulant on the first coating can be applied before and after step b).

[00248] In one aspect, the glove former can be pre-heated.

[00249] In one aspect, the method further comprises removing the supported elastomeric glove material from the glove former.

[00250] In one aspect, the method further comprises leaching after step d).

[00251] In one aspect, the method further comprises after step d) curing the composition.

[00252] Suitable support materials include, but are not limited to the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

2. METHODS TO PRODUCE BIODEGRADABLE THERMOPLASTIC GLOVES

A. UNSUPPORTED GLOVES

[00253] Also disclosed herein is a method for producing a biodegradable thermoplastic glove, comprising: a) providing a glove former having a predetermined size and shape; b) coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising i. a halogen containing thermoplastic polymer comprising polyvinyl chloride, and ii. a biodegradation agent, c) curing the coating of step b) to provide an thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00254] In one aspect, the composition can further comprise a plasticizer.

[00255] In one aspect, the method can further comprise before step c) beading a portion of the coating.

[00256] In one aspect, the method can further comprise removing the elastomeric glove material from the glove former.

[00257] In one aspect, the glove former can be pre-heated.

B. SUPPORTED GLOVES

[00258] Also disclosed herein is a method of for producing a biodegradable thermoplastic glove, comprising: a) providing a glove former having a predetermined size and shape and being at least partially lined with a support material; b) contacting at least a portion of the support material of step a) with a composition comprising i. halogen containing thermoplastic polymer comprising polyvinyl chloride; and ii. a biodegradation agent, to provide a first coating of the composition on the support material; c) allowing the first coating to at least partially set; and d) repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00259] In one aspect, the composition further comprises a plasticizer.

[00260] In one aspect, the method further comprises after step d) curing the coating.

[00261] In one aspect, the method further comprises removing the supported thermoplastic glove material from the glove former.

[00262] In one aspect, the glove former can be pre-heated.

[00263] In one aspect, the method further comprises removing the supported thermoplastic glove material from the glove former.

B. ASPECTS

[00264] Aspect 1: A biodegradable elastomeric material formed from a composition comprising:

a) an acrylonitrile butadiene based rubber;
b) an alkali stabilizing agent;
c) a metal oxide crosslinking agent; and
d) a biodegradation agent,

wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[00265] Aspect 2: The biodegradable elastomeric material of aspect 1, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00266] Aspect 3: The biodegradable elastomeric material of aspect 1 or 2, wherein the alkali stabilizer comprises an alkali hydroxide.

[00267] Aspect 4: The biodegradable elastomeric material of any of aspects 1 through 3 wherein the alkali stabilizer comprises potassium hydroxide.

[00268] Aspect 5: The biodegradable elastomeric material of aspects 1 or 2, wherein the alkali stabilizing agent comprises ammonia.

[00269] Aspect 6: The biodegradable elastomeric material of aspect 5, wherein the composition has a pH in the range of from about 8.5 to about 10.5.

[00270] Aspect 7: The biodegradable elastomeric material according to any one of aspects 1 to 6, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

[00271] Aspect 8: The biodegradable elastomeric material according to any one of aspects 1 to 7, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

[00272] Aspect 9: The biodegradable elastomeric material according to any one of aspects 7 to 8 wherein the metal oxide crosslinking agent is zinc oxide or magnesium oxide.

[00273] Aspect 10: The biodegradable elastomeric material according to any one of aspects 1 to 9, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile rubber.

[00274] Aspect 11: The biodegradable elastomeric material according to any one of aspects 1 to 10, wherein the metal oxide crosslinking agent comprises zinc oxide.

[00275] Aspect 12: The biodegradable elastomeric material according to any one of aspects 1 to 11, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00276] Aspect 13: The biodegradable elastomeric material of 12, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00277] Aspect 14: The biodegradable elastomeric material according to any one of aspects 1 to 13, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00278] Aspect 15: The biodegradable elastomeric material according to any one of aspects 1 to 14, wherein the biodegradation agent comprises a carboxylic acid compound.

[00279] Aspect 16: The biodegradable elastomeric material according to any one of aspects 1 to 15, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00280] Aspect 17: The biodegradable elastomeric material according to aspect 15, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00281] Aspect 18: The biodegradable elastomeric material according to aspect 15, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00282] Aspect 19: The biodegradable elastomeric material according to aspect 15, wherein the biodegradation agent further comprises a compatibilizing additive.

[00283] Aspect 20: The biodegradable elastomeric material according to aspect 15, wherein the biodegradation agent further comprises a carrier resin.

[00284] Aspect 21: The biodegradable elastomeric material according to aspect 15, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00285] Aspect 22: The biodegradable elastomeric material according to aspect 15, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00286] Aspect 23: The biodegradable elastomeric material according to aspect 15, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00287] Aspect 24: The biodegradable elastomeric material according to any one of aspects 1 to 23, wherein the elastomeric material is vulcanized.

[00288] Aspect 25: The biodegradable elastomeric material according to any one of aspects 1 to 24, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

[00289] Aspect 26: The biodegradable elastomeric material according to aspect 25, wherein the carboxylic acid is ethylene acrylic acid.

[00290] Aspect 27: The biodegradable elastomeric material according to aspect 1, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00291] Aspect 28: The biodegradable elastomeric material according to aspect 1, wherein the biodegradation agent comprises polybutylene succinate.

[00292] Aspect 29: The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material is biodegradable under aerobic conditions.

[00293] Aspect 30: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material is biodegradable under anaerobic conditions.

[00294] Aspect 31: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

[00295] Aspect 32: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

[00296] Aspect 33: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

[00297] Aspect 34: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

[00298] Aspect 35: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00299] Aspect 36: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00300] Aspect 37: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00301] Aspect 38: The biodegradable elastomeric material according to any one of the preceding aspects, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00302] Aspect 39: A biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising:

a) an acrylonitrile butadiene based rubber;
b) an alkali stabilizing agent;
c) a metal oxide crosslinking agent; and
d) a biodegradation agent,

wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00303] Aspect 40: The biodegradable elastomeric glove of aspect 39 wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00304] Aspect 41: The biodegradable elastomeric glove of aspect 39 or 40, wherein the alkali stabilizer comprises an alkali hydroxide.

[00305] Aspect 42: The biodegradable elastomeric glove of any of aspects 39 through 41, wherein the alkali stabilizer comprises potassium hydroxide.

[00306] Aspect 43: The biodegradable elastomeric glove of aspects 39 or 40, wherein the alkali stabilizing agent comprises ammonia.

[00307] Aspect 44: The biodegradable elastomeric glove of aspect 43, wherein the composition has a pH of from about 8.5 to about 10.5.

[00308] Aspect 45: The biodegradable elastomeric glove according to any one of aspects 39 to 44, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

[00309] Aspect 46: The biodegradable elastomeric glove according to any one of aspects 39 to 45, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

[00310] Aspect 47: The biodegradable elastomeric glove according to any one of aspects 39 to 46, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00311] Aspect 48: The biodegradable elastomeric glove according to any one of aspects 39 to 47, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

[00312] Aspect 49: The biodegradable elastomeric glove according to any one of aspects 39 to 48, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00313] Aspect 50: The biodegradable elastomeric glove of aspect 49, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00314] Aspect 51: The biodegradable elastomeric glove according to any one of aspects 39 to 50, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00315] Aspect 52: The biodegradable elastomeric glove according to any one of aspects 39 to 51, wherein the biodegradation agent comprises a carboxylic acid compound.

[00316] Aspect 53: The biodegradable elastomeric glove according to any one of aspects 39 to 52, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00317] Aspect 54: The biodegradable elastomeric glove according to aspect 53, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00318] Aspect 55: The biodegradable elastomeric glove according to aspect 53, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00319] Aspect 56: The biodegradable elastomeric glove according to aspect 53, wherein the biodegradation agent further comprises a compatibilizing additive.

[00320] Aspect 57: The biodegradable elastomeric glove according to aspect 53, wherein the biodegradation agent further comprises a carrier resin.

[00321] Aspect 58: The biodegradable elastomeric glove according to aspect 53, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00322] Aspect 59: The biodegradable elastomeric glove according to aspect 53, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00323] Aspect 60: The biodegradable elastomeric glove according to aspect 53, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00324] Aspect 61: The biodegradable elastomeric glove according to any one of aspects 39-60, wherein the elastomeric glove material is vulcanized.

[00325] Aspect 62: The biodegradable elastomeric glove according to aspect 39, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00326] Aspect 63: The biodegradable elastomeric glove according to aspect 39, wherein the biodegradation agent comprises polybutylene succinate.

[00327] Aspect 64: The biodegradable elastomeric glove according to any one of aspects 39-60, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

[00328] Aspect 65: The biodegradable elastomeric material according to aspect 64, wherein the carboxylic acid is ethylene acrylic acid.

[00329] Aspect 66: The biodegradable elastomeric glove according to any one of aspects 39-65, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00330] Aspect 67: The biodegradable elastomeric glove according to any one of aspects 39-66, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00331] Aspect 68: The biodegradable elastomeric glove according to any one of aspects 39-67, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00332] Aspect 69: The biodegradable elastomeric glove according to any one of aspects 39-68, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00333] Aspect 70: The biodegradable elastomeric glove according to any one of aspects 39-69, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00334] Aspect 71: The biodegradable elastomeric glove according to any one of aspects 39-70, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00335] Aspect 72: The biodegradable elastomeric glove according to any one aspects 39-71, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00336] Aspect 73: The biodegradable elastomeric glove according to any one of aspects 39-72, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00337] Aspect 74: The biodegradable elastomeric glove according to any one of aspects 39-73, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00338] Aspect 75: The biodegradable elastomeric glove according to any one of aspects 39-74, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00339] Aspect 76: The biodegradable elastomeric glove according to any one of aspects 39-75, wherein the biodegradable elastomeric glove material is unsupported.

[00340] Aspect 77: The biodegradable elastomeric glove according to any one of aspects 39-76, wherein the biodegradable elastomeric glove is supported.

[00341] Aspect 78: The biodegradable elastomeric glove according to aspect 77, wherein the biodegradable elastomeric glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00342] Aspect 79: A biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising:

a) a halogen containing elastomeric polymer comprising polychloroprene; and

b) a biodegradation agent,

wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00343] Aspect 80: The biodegradable elastomeric glove of aspect 79, wherein the halogen containing polymer is polychloroprene.

[00344] Aspect 81: The biodegradable elastomeric glove of aspects 79 or 80, wherein the composition further comprises a metal oxide cross linking agent.

[00345] Aspect 82: The biodegradable elastomeric glove of aspect 81, wherein the metal oxide cross linking agent is zinc oxide or magnesium oxide.

[00346] Aspect 83: The biodegradable elastomeric glove according to aspects 81 or 82, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00347] Aspect 84: The biodegradable elastomeric glove according to any one of aspects 79 to 83, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00348] Aspect 85: The biodegradable elastomeric glove of aspect 84, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00349] Aspect 86: The biodegradable elastomeric glove according to any one of aspects 79 to 85, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00350] Aspect 87: The biodegradable elastomeric glove according to any one of aspects 79 to 86, wherein the biodegradation agent comprises a carboxylic acid compound.

[00351] Aspect 88: The biodegradable elastomeric glove according to any one of aspects 79 to 87, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00352] Aspect 89: The biodegradable elastomeric glove according to aspect 88, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

[00353] Aspect 90: The biodegradable elastomeric glove according to aspect 88, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00354] Aspect 91: The biodegradable elastomeric glove according to aspect 88, wherein the biodegradation agent further comprises a compatibilizing additive.

[00355] Aspect 92: The biodegradable elastomeric glove according to aspect 88, wherein the biodegradation agent further comprises a carrier resin.

[00356] Aspect 93: The biodegradable elastomeric glove according to aspect 88, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00357] Aspect 94: The biodegradable elastomeric glove according to aspect 88, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00358] Aspect 95: The biodegradable elastomeric glove according to aspect 88, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

[00359] Aspect 96: The biodegradable elastomeric glove according to any one of aspects 79 to 95, wherein the elastomeric glove material is vulcanized.

[00360] Aspect 97: The biodegradable elastomeric glove according to any one of aspects 79 to 95, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

[00361] Aspect 98: The biodegradable elastomeric material according to aspect 97, wherein the carboxylic acid is ethylene acrylic acid.

[00362] Aspect 99: The biodegradable elastomeric glove according to any one of aspects 79-98, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00363] Aspect 100: The biodegradable elastomeric glove according to any one of aspects 79-98, wherein the biodegradation agent comprises polybutylene succinate.

[00364] Aspect 101: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00365] Aspect 102: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00366] Aspect 103: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00367] Aspect 104: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00368] Aspect 105: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00369] Aspect 106: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00370] Aspect 107: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00371] Aspect 108: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00372] Aspect 109: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00373] Aspect 110: The biodegradable elastomeric glove according to any one of aspects 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00374] Aspect 111: The biodegradable elastomeric glove according to any one of aspects 79 to 110, wherein the biodegradable elastomeric glove is unsupported.

[00375] Aspect 112: The biodegradable elastomeric glove according to any one of aspects 79 to 110, wherein the biodegradable elastomeric glove is supported.

[00376] Aspect 113: The biodegradable elastomeric glove according to aspect 112, wherein the biodegradable elastomeric glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel,

carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00377] Aspect 114: A biodegradable elastomeric material, formed from a composition comprising:

a) a halogen containing elastomeric polymer comprising polychloroprene; and
b) a biodegradation agent.

wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

[00378] Aspect 115: The biodegradable elastomeric material of aspect 114, wherein the halogen containing polymer is polychloroprene.

[00379] Aspect 116: The biodegradable elastomeric material of aspects 114 or 115, wherein the composition further comprises a metal oxide cross linking agent.

[00380] Aspect 117: The biodegradable elastomeric material of aspect 116, wherein the metal oxide cross linking agent is zinc oxide or magnesium oxide.

[00381] Aspect 118: The biodegradable elastomeric material according to aspect 116, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00382] Aspect 119: The biodegradable elastomeric material according to any one of aspects 114 to 118, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

[00383] Aspect 120: The biodegradable elastomeric material of aspect 119, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00384] Aspect 121: The biodegradable elastomeric material according to any one of aspects 114 to 120, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00385] Aspect 122: The biodegradable elastomeric material according to any one of aspects 114 to 121, wherein the biodegradation agent comprises a carboxylic acid compound.

[00386] Aspect 123: The biodegradable elastomeric material according to any one of aspects 114 to 122, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00387] Aspect 124: The biodegradable elastomeric material according to aspect 123, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

[00388] Aspect 125: The biodegradable elastomeric material according to aspect 123, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00389] Aspect 126: The biodegradable elastomeric material according to aspect 123, wherein the biodegradation agent further comprises a compatibilizing additive.

[00390] Aspect 127: The biodegradable elastomeric material according to aspect 123, wherein the biodegradation agent further comprises a carrier resin.

[00391] Aspect 128: The biodegradable elastomeric material according to aspect 123, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00392] Aspect 129: The biodegradable elastomeric material according to aspect 123, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00393] Aspect 130: The biodegradable elastomeric material according to aspect 123, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00394] Aspect 131: The biodegradable elastomeric material according to any one of aspects 114 to 130, wherein the elastomeric material is vulcanized.

[00395] Aspect 132: The biodegradable elastomeric material according to any one of aspects 114 to 130, wherein the composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

[00396] Aspect 133: The biodegradable elastomeric material according to aspect 132, wherein the carboxylic acid is ethylene acrylic acid.

[00397] Aspect 134: The biodegradable elastomeric material according to aspect 132, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00398] Aspect 135: The biodegradable elastomeric material according to aspect 132, wherein the biodegradation agent comprises polybutylene succinate.

[00399] Aspect 136: The biodegradable elastomeric material according to any one of aspects 114 to 131, wherein the biodegradable elastomeric material is biodegradable under aerobic conditions.

[00400] Aspect 137: The biodegradable elastomeric material according to any one of aspects 114 to 132, wherein the biodegradable elastomeric material is biodegradable under anaerobic conditions.

[00401] Aspect 138: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation

after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

[00402] Aspect 139: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

[00403] Aspect 140: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

[00404] Aspect 141: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

[00405] Aspect 142: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00406] Aspect 143: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00407] Aspect 144: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00408] Aspect 145: The biodegradable elastomeric material according to any one of aspects 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00409] Aspect 146: A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape;
b. contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former;
c. drying the coagulant coating;
d. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
    i. an acrylonitrile butadiene based rubber;
    ii. an alkali stabilizing agent;
    iii. a metal oxide crosslinking agent; and
    iv. a biodegradation agent,
e. curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00410] Aspect 147: The method of aspect 146, further comprising before step e) beading a portion of the coating.

[00411] Aspect 148: The method of aspect 146, further comprising removing the elastomeric glove material from the glove former.

[00412] Aspect 149: The method of aspect 146, further comprising before and/or after step e) the step of leaching to remove coagulant.

[00413] Aspect 150: The method of aspect 146, further comprising after leaching to remove the coagulant, beading a portion of the coating.

[00414] Aspect 151: The method of aspect 146, wherein the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

[00415] Aspect 152: The method of aspect 146, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00416] Aspect 153: The method of aspect 146, wherein the alkali stabilizer comprises an alkali hydroxide.

[00417] Aspect 154: The method of aspect 146, wherein the alkali stabilizer comprises potassium hydroxide.

[00418] Aspect 155: The method of aspect 146, wherein the alkali stabilizing agent comprises ammonia.

[00419] Aspect 156: The method of aspect 146, wherein the composition has a pH of from about 8.5 to about 10.5.

[00420] Aspect 157: The method of aspect 146, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

[00421] Aspect 158: The method of aspect 146, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

[00422] Aspect 159: The method of aspect 146, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00423] Aspect 160: The method of aspect 146, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

[00424] Aspect 161: The method of aspect 146, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00425] Aspect 162: The method of aspect 146, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00426] Aspect 163: The method of aspect 146, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00427] Aspect 164: The method of aspect 146, wherein the biodegradation agent comprises a carboxylic acid compound.

[00428] Aspect 165: The method of aspect 146, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00429] Aspect 166: The method of aspect 146, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00430] Aspect 167: The method of aspect 146, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber and any copolymers of said polymers.

[00431] Aspect 168: The method of aspect 146, wherein the biodegradation agent further comprises a compatibilizing additive.

[00432] Aspect 169: The method of aspect 146, wherein the biodegradation agent further comprises a carrier resin.

[00433] Aspect 170: The method of aspect 169, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00434] Aspect 171: The method of aspect 146, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00435] Aspect 172: The method of aspect 146, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00436] Aspect 173: The method of aspect 146, wherein the curing step e) provides a vulcanized elastomeric glove material.

[00437] Aspect 174: The method of aspect 146, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

[00438] Aspect 175: The method of aspect 174, wherein the carboxylic acid is ethylene acrylic acid.

[00439] Aspect 176: The method according to aspect 146, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00440] Aspect 177: The method according to aspect 146, wherein the biodegradation agent comprises polybutylene succinate.

[00441] Aspect 178: The method of aspect 146, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00442] Aspect 179: The method of aspect 146, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00443] Aspect 180: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00444] Aspect 181: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00445] Aspect 182: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00446] Aspect 183: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00447] Aspect 184: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00448] Aspect 185: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00449] Aspect 186: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00450] Aspect 187: The method of aspect 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00451] Aspect 188: A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
b. contacting at least a portion of the support material of step a) with a composition comprising
    i. an acrylonitrile butadiene based rubber;
    ii. an alkali stabilizing agent;
    iii. a metal oxide crosslinking agent; and
    iv. a biodegradation agent,

   to provide a first coating of the composition on the support material;
c. allowing the first coating to at least partially set;
d. repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00452] Aspect 189: The method of aspect 188, further comprising removing the supported elastomeric glove material from the glove former.

[00453] Aspect 190: The method of aspect 188, further comprising leaching after step d).

[00454] Aspect 191: The method of aspect 188, further comprising after step d) curing the composition.

[00455] Aspect 192: The method of aspect 188, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00456] Aspect 193: The method of aspect 188, wherein the alkali stabilizer comprises an alkali hydroxide.

[00457] Aspect 194: The method of aspect 188, wherein the alkali stabilizer comprises potassium hydroxide.

[00458] Aspect 195: The method of aspect 188, wherein the alkali stabilizing agent comprises ammonia.

[00459] Aspect 196: The method of aspect 188, wherein the composition has a pH of from about 8.5 to about 10.5.

[00460] Aspect 197: The method of aspect 188, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

[00461] Aspect 198: The method of aspect 188, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

[00462] Aspect 199: The method of aspect 188, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00463] Aspect 200: The method of aspect 188, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

[00464] Aspect 201: The method of aspect 188, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, thickener and odorant, or a combination thereof.

[00465] Aspect 202: The method of aspect 188, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00466] Aspect 203: The method of aspect 188, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

[00467] Aspect 204: The method of aspect 188, wherein the biodegradation agent comprises a carboxylic acid compound.

[00468] Aspect 205: The method of aspect 188, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00469] Aspect 206: The method of aspect 188, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00470] Aspect 207: The method of aspect 188, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00471] Aspect 208: The method of aspect 188, wherein the biodegradation agent further comprises a compatibilizing additive.

[00472] Aspect 209: The method of aspect 188, wherein the biodegradation agent further comprises a carrier resin.

[00473] Aspect 210: The method of aspect 209, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

[00474] Aspect 211: The method of aspect 188, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00475] Aspect 212: The method of aspect 188, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00476] Aspect 213: The method of aspect 188, wherein the curing step e) provides a vulcanized elastomeric glove material.

[00477] Aspect 214: The method of aspect 177, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

[00478] Aspect 215: The method of aspect 214, wherein the carboxylic acid is ethylene acrylic acid.

[00479] Aspect 216: The method of aspect 188, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00480] Aspect 217: The method of aspect 188, wherein the biodegradation agent comprises polybutylene succinate.

[00481] Aspect 218: The method of aspect 188, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00482] Aspect 219: The method of aspect 188, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00483] Aspect 220: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00484] Aspect 221: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00485] Aspect 222: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00486] Aspect 223: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00487] Aspect 224: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00488] Aspect 225: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00489] Aspect 226: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00490] Aspect 227: The method of aspect 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00491] Aspect 228: The method of aspect 188, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00492] Aspect 229: A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape;

b. contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former;
c. drying the coagulant coating;
d. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
    i. a halogen containing elastomeric polymer comprising polychloroprene, and
    ii. a biodegradation agent,
e. curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00493] Aspect 230: The method of aspect 229, wherein the halogen containing elastomeric polymer is polychloroprene.

[00494] Aspect 231: The method of aspect 229, further comprising before step e) beading a portion of the coating.

[00495] Aspect 232: The method of aspect 229, further comprising removing the elastomeric glove material from the glove former.

[00496] Aspect 233: The method of aspect 229, further comprising before and/or after step e) the step of leaching to remove coagulant.

[00497] Aspect 234: The method of aspect 229, wherein the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

[00498] Aspect 235: The method of aspect 229, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00499] Aspect 236: The method of aspect 229, wherein the alkali stabilizer comprises an alkali hydroxide.

[00500] Aspect 237: The method of aspect 229, wherein the composition further comprises a metal oxide crosslinking agent and wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00501] Aspect 238: The method of aspect 237, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

[00502] Aspect 239: The method of aspect 229, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00503] Aspect 240: The method of aspect 229, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00504] Aspect 241: The method of aspect 229, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00505] Aspect 242: The method of aspect 229, wherein the biodegradation agent comprises a carboxylic acid compound.

[00506] Aspect 243: The method of aspect 229, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00507] Aspect 244: The method of aspect 229, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00508] Aspect 245: The method of aspect 229, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00509] Aspect 246: The method of aspect 229, wherein the biodegradation agent further comprises a compatibilizing additive.

[00510] Aspect 247: The method of aspect 229, wherein the biodegradation agent further comprises a carrier resin.

[00511] Aspect 248: The method of aspect 247, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00512] Aspect 249: The method of aspect 229, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00513] Aspect 250: The method of aspect 229, wherein the chemo taxis agent comprises a sugar, a coumarin or a furanone.

[00514] Aspect 251: The method of aspect 229, wherein the curing step e) provides a vulcanized elastomeric glove material.

[00515] Aspect 252: The method of aspect 229, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

[00516] Aspect 253: The method of aspect 252, wherein the carboxylic acid is ethylene acrylic acid.

[00517] Aspect 254: The method of aspect 229, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00518] Aspect 255: The method of aspect 229, wherein the biodegradation agent comprises polybutylene succinate.

[00519] Aspect 256: The method of aspect 229, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00520] Aspect 257: The method of aspect 229, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00521] Aspect 258: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00522] Aspect 259: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00523] Aspect 260: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00524] Aspect 261: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00525] Aspect 262: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00526] Aspect 263: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00527] Aspect 264: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00528] Aspect 265: The method of aspect 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00529] Aspect 266: A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
b. contacting at least a portion of the support material of step a) with a composition comprising
    i. halogen containing elastomeric polymer comprising polychloroprene; and
    ii. a biodegradation agent,

    to provide a first coating of the composition on the support material;
c. allowing the first coating to at least partially set; and
d. repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

[00530] Aspect 267: The method of aspect 266, further comprising at least partially coating a coagulant on the first coating.

[00531] Aspect 268: The method of aspect 266, wherein the halogen containing elastomeric polymer is polychloroprene.

[00532] Aspect 269: The method of aspect 266, further comprising after step d) curing the coating.

[00533] Aspect 270: The method of aspect 269, further comprising removing the supported elastomeric glove material from the glove former.

[00534] Aspect 271: The method of aspect 266, wherein the composition comprises a metal oxide crosslinking agent and wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00535] Aspect 272: The method of aspect 271, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

[00536] Aspect 273: The method of aspect 266, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

[00537] Aspect 274: The method of aspect 266, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00538] Aspect 275: The method of aspect 266, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

[00539] Aspect 276: The method of aspect 266, wherein the biodegradation agent comprises a carboxylic acid compound.

[00540] Aspect 277: The method of aspect 266, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00541] Aspect 278: The method of aspect 266, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

[00542] Aspect 279: The method of aspect 266, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00543] Aspect 280: The method of aspect 266, wherein the biodegradation agent further comprises a compatibilizing additive.

[00544] Aspect 281: The method of aspect 266, wherein the biodegradation agent further comprises a carrier resin.

[00545] Aspect 282: The method of aspect 281, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00546] Aspect 283: The method of aspect 266, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00547] Aspect 284: The method of aspect 266, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00548] Aspect 285: The method of aspect 266, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

[00549] Aspect 286: The method of aspect 285, wherein the carboxylic acid is ethylene acrylic acid.

[00550] Aspect 287: The method of aspect 266, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00551] Aspect 288: The method of aspect 266, wherein the biodegradation agent comprises polybutylene succinate.

[00552] Aspect 289: The method of aspect 266, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

[00553] Aspect 290: The method of aspect 266, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

[00554] Aspect 291: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

[00555] Aspect 292: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

[00556] Aspect 293: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

[00557] Aspect 294: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

[00558] Aspect 295: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00559] Aspect 296: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00560] Aspect 297: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00561] Aspect 298: The method of aspect 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00562] Aspect 299: The method of aspect 266, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00563] Aspect 300: A biodegradable thermoplastic material, formed from a composition comprising:

a) a halogen containing thermoplastic polymer comprising polyvinyl chloride;
b) a biodegradation agent; and
c) a plasticizer,

wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic material in the absence of the biodegradation agent.

[00564] Aspect 301: The biodegradable thermoplastic material of aspect 300, wherein the halogen containing polymer is polyvinyl chloride.

[00565] Aspect 302: The biodegradable thermoplastic material of aspect 300, wherein the plasticizer comprises to Di-isononyl Phthalate, 1-[2-(benzoyloxy)propoxy] propan-2-yl benzoate, or epoxidized soybean oil, or a combination thereof.

[00566] Aspect 303: The biodegradable thermoplastic material of aspect 300, wherein the plasticizer is present in an amount of from greater than 0 to about 160.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00567] Aspect 304: The biodegradable thermoplastic material according to any one of aspects 300 to 305, wherein the composition further comprises at least one additive selected from the group consisting of an inorganic filler, and pigment.

[00568] Aspect 305: The biodegradable thermoplastic material of aspect 304, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00569] Aspect 306: The biodegradable thermoplastic material according to any one of aspects 300 to 305, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00570] Aspect 307: The biodegradable thermoplastic material according to any one of aspects 300 to 306, wherein the biodegradation agent comprises a carboxylic acid compound.

[00571] Aspect 308: The biodegradable thermoplastic material according to any one of aspects 300 to 307, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00572] Aspect 309: The biodegradable thermoplastic material according to aspect 308, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

[00573] Aspect 310: The biodegradable thermoplastic material according to aspect 308, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00574] Aspect 311: The biodegradable thermoplastic material according to aspect 308, wherein the biodegradation agent further comprises a compatibilizing additive.

[00575] Aspect 312: The biodegradable thermoplastic material according to aspect 308, wherein the biodegradation agent further comprises a carrier resin.

[00576] Aspect 313: The biodegradable thermoplastic material according to aspect 308, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00577] Aspect 314: The biodegradable thermoplastic material according to aspect 308, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00578] Aspect 315: The biodegradable thermoplastic material according to aspect 308, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00579] Aspect 316: The biodegradable thermoplastic material according to 308, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00580] Aspect 317: The biodegradable thermoplastic material according to 308, wherein the biodegradation agent comprises polybutylene succinate.

[00581] Aspect 318: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material is biodegradable under aerobic conditions.

[00582] Aspect 319: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material is biodegradable under anaerobic conditions.

[00583] Aspect 320: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic material after 30 days.

[00584] Aspect 321: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic material after 65 days.

[00585] Aspect 322: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic material after 120 days.

[00586] Aspect 323: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic material after 160 days.

[00587] Aspect 324: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00588] Aspect 325: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00589] Aspect 326: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00590] Aspect 327: The biodegradable thermoplastic material according to any one of aspects 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00591] Aspect 328: A method for producing a biodegradable thermoplastic glove, comprising:

a. providing a glove former having a predetermined size and shape;
b. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
    i. a halogen containing thermoplastic polymer comprising polyvinyl chloride, and
    ii. a biodegradation agent,
c. curing the coating of step b) to provide an thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00592] Aspect 329: The method of aspect 328, the method can further comprise before step c) beading a portion of the coating.

[00593] Aspect 330: The method of aspect 328, the method can further comprise removing the thermoplastic glove material from the glove former.

[00594] Aspect 331: The method of aspect 328, wherein the halogen containing thermoplastic polymer is polyvinyl chloride.

[00595] Aspect 332: The method of aspect 328, wherein the composition further comprises a plasticizer.

[00596] Aspect 333: The method of aspect 328, wherein the composition further comprises at least one additive selected from the group consisting of a inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

[00597] Aspect 334: The method of aspect 328, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00598] Aspect 335: The method of aspect 328, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00599] Aspect 336: The method of aspect 328, wherein the biodegradation agent comprises a carboxylic acid compound.

[00600] Aspect 337: The method of aspect 328, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00601] Aspect 338: The method of aspect 328, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

[00602] Aspect 339: The method of aspect 328, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00603] Aspect 340: The method of aspect 328, wherein the biodegradation agent further comprises a compatibilizing additive.

[00604] Aspect 341: The method of aspect 328, wherein the biodegradation agent further comprises a carrier resin.

[00605] Aspect 342: The method of aspect 341, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00606] Aspect 343: The method of aspect 328, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00607] Aspect 344: The method of aspect 328, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

[00608] Aspect 345: The method of aspect 328, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00609] Aspect 346: The method of aspect 328, wherein the biodegradation agent comprises polybutylene succinate.

[00610] Aspect 347: The method of aspect 328, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

[00611] Aspect 348: The method of aspect 328, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

[00612] Aspect 349: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

[00613] Aspect 350: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an

ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

[00614] Aspect 351: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

[00615] Aspect 352: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

[00616] Aspect 353: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00617] Aspect 354: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00618] Aspect 355: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00619] Aspect 356: The method of aspect 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00620] Aspect 357: A method for producing a biodegradable thermoplastic glove, comprising:

a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
b. contacting at least a portion of the support material of step a) with a composition comprising
   i. halogen containing thermoplastic polymer comprising polyvinyl chloride;
   ii. a plasticizer; and
   iii. a biodegradation agent,

   to provide a first coating of the composition on the support material;
c. allowing the first coating to at least partially set; and
d. repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00621] Aspect 358: The method of aspect 357, wherein the composition further comprises a plasticizer.

[00622] Aspect 359: The method of aspect 357, wherein the halogen containing thermoplastic polymer is polyvinyl chloride.

[00623] Aspect 360: The method of aspect 357, further comprising after step d) curing the coating.

[00624] Aspect 361: The method of aspect 357, further comprising removing the supported thermoplastic glove material from the glove former.

[00625] Aspect 362: The method of aspect 357, wherein the composition further comprises at least one additive selected from the group consisting of an inorganic filler, and pigment.

[00626] Aspect 363: The method of aspect 357, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00627] Aspect 364: The method of aspect 357, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00628] Aspect 365: The method of aspect 357, wherein the biodegradation agent comprises a carboxylic acid compound.

[00629] Aspect 366: The method of aspect 357, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00630] Aspect 367: The method of aspect 357, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

[00631] Aspect 368: The method of aspect 357, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00632] Aspect 369: The method of aspect 357, wherein the biodegradation agent further comprises a compatibilizing additive.

[00633] Aspect 370: The method of aspect 357, wherein the biodegradation agent further comprises a carrier resin.

[00634] Aspect 371: The method of aspect 370, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00635] Aspect 372: The method of aspect 357, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00636] Aspect 373: The method of aspect 357, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

[00637] Aspect 374: The method of aspect 357, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00638] Aspect 375: The method of aspect 357, wherein the biodegradation agent comprises polybutylene succinate.

[00639] Aspect 376: The method of aspect 357, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

[00640] Aspect 377: The method of aspect 357, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

[00641] Aspect 378: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

[00642] Aspect 379: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

[00643] Aspect 380: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater

than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

[00644] Aspect 381: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

[00645] Aspect 382: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00646] Aspect 383: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00647] Aspect 384: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00648] Aspect 385: The method of aspect 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00649] Aspect 386: The method of aspect 357, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

[00650] Aspect 387: A biodegradable thermoplastic glove, comprising a biodegradable thermoplastic glove material formed from a composition comprising:

a) a halogen containing thermoplastic polymer comprising polyvinyl chloride; and

b) a biodegradation agent,

wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

[00651] Aspect 388: The biodegradable thermoplastic glove of aspect 387, wherein the composition further comprises a plasticizer.

[00652] Aspect 389: The biodegradable thermoplastic glove of aspect 387, wherein the halogen containing polymer is polyvinyl chloride.

[00653] Aspect 390: The biodegradable thermoplastic glove according to any one of aspects 387 to 389, wherein the composition further comprises at least one additive selected from the group consisting of a inorganic filler, and pigment.

[00654] Aspect 391: The biodegradable thermoplastic glove of aspect 390, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00655] Aspect 392: The biodegradable thermoplastic glove according to any one of aspects 387 to 391, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

[00656] Aspect 393: The biodegradable thermoplastic glove according to any one of aspects 387 to 392, wherein the biodegradation agent comprises a carboxylic acid compound.

[00657] Aspect 394: The biodegradable thermoplastic glove according to any one of aspects 387 to 393, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

[00658] Aspect 395: The biodegradable thermoplastic glove according to aspect 394, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

[00659] Aspect 396: The biodegradable thermoplastic glove according to aspect 394, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

[00660] Aspect 397: The biodegradable thermoplastic glove according to aspect 394, wherein the biodegradation agent further comprises a compatibilizing additive.

[00661] Aspect 398: The biodegradable thermoplastic glove according to aspect 394, wherein the biodegradation agent further comprises a carrier resin.

[00662] Aspect 399: The biodegradable thermoplastic glove according to aspect 394, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

[00663] Aspect 400: The biodegradable thermoplastic glove according to aspect 394, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

[00664] Aspect 401: The biodegradable thermoplastic glove according to aspect 394, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

[00665] Aspect 402: The method of aspect 394, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

[00666] Aspect 403: The method of aspect 394, wherein the biodegradation agent comprises polybutylene succinate.

[00667] Aspect 404: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

[00668] Aspect 405: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

[00669] Aspect 406: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

[00670] Aspect 407: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

[00671] Aspect 408: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

[00672] Aspect 409: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

[00673] Aspect 410: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

[00674] Aspect 411: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

[00675] Aspect 412: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

[00676] Aspect 413: The biodegradable thermoplastic glove according to any one of aspects 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

[00677] Aspect 414: The biodegradable thermoplastic glove according to any one of aspects 387 to 413, wherein the biodegradable thermoplastic glove is unsupported.

[00678] Aspect 415: The biodegradable thermoplastic glove according to any one of aspects 387 to 413, wherein the biodegradable thermoplastic glove is supported.

[00679] Aspect 416: The biodegradable thermoplastic glove according to aspect 415, wherein the biodegradable thermoplastic glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

C. EXAMPLES

[00680] The following examples are put forth so as to provide those of ordinary skill in the art with a complete disclosure and description of how the compounds, compositions, articles, devices and/or methods claimed herein are made and evaluated, and are intended to be purely exemplary of the invention and are not intended to limit the scope of what the inventors regard as their invention. Efforts have been made to ensure accuracy with respect to numbers (e.g., amounts, temperature, etc.), but some errors and deviations should be accounted for.

Unless indicated otherwise, parts are parts by weight, temperature is in °C or is at ambient temperature, and pressure is at or near atmospheric.

EXAMPLE 1 – COMPOSITIONS, MATERIALS AND GLOVES

NITRILE EXAMINATION GLOVE

[00681] An exemplary glove produced by the methods described herein can comprise the composition as described in Table 1

TABLE 1

Chemical	Function	Dry Parts
Carboxylated Acrylonitrile Butadiene latex	Polymer	100
Polyether modified polysiloxane	Heat sensitizer	0.23
Potassium Hydroxide	Alkali stabilizer	1.39
Zinc Oxide	Cross-linker	1.4
Ethylene Acrylic Acid	Crosslinker	0.5
Carnauba/Paraffin wax emulsion	Release aid	2.45
Carbon black	Black Pigment	2.3
Cherry Flavoring	Reodorant	0.003
Benzoisothiazolinone	Biocide	0.02
SR5300 by ENSO Plastics	Biodegradation agent	1.13

[00682] For example, a glove made from the compositions described herein can be made by following the order of the steps is Table 2

TABLE 2

Clean formers using chemical or physical means (eg dilute acid, alkali and/or bleach)
Formers heated (either by process residual heat or preheat)
Dip into calcium nitrate or calcium chloride coagulant
Dry coagulant
Dip into the compositions described herein (for example, the composition of Table 1)
Leach to remove residual coagulant and surfactant
Bead gloves mechanically (roll down upper cuff)
Optional coating in donnability coating or slip coat
Dry and cure
Optional coating in powder wash or chlorinate gloves in lieu of donnability coating
Strip and pack (optional post production wash and dry and/or chlorination)

EXAMPLE 2 – BIODEGRADATION

[00683] The biodegradation of the biodegradable gloves described in Example 1 was measured after various time intervals. Table 3 shows the degradation data after 30 days of degradation process. Figure 1A and 1B show a plot of the degradation data which shows that materials and gloves with the degradation agent degrade faster than a material or glove without the degradation agent.

TABLE 3

	Inculum	Negative	Positive	241A - Untreated Gloves	242A - Treated Gloves
Cumulative Gas Volume (mL)	2134.7	1798.5	9843.8	2745.5	3725.0
Percent CH_4 (%)	40.8	45.9	39.8	29.6	24.2
Volume CH_4 (mL)	871.8	825.2	3913.8	811.9	901.2
Mass CH_4 (g)	0.62	0.59	2.80	0.58	0.64
Percent CO_2 (%)	43.5	38.7	42.1	48.9	46.6
Volume CO_2 (mL)	928.6	695.9	4143.8	1342.6	1737.2
Mass CO_2 (g)	1.82	1.37	8.14	2.64	3.41
Sample Mass (g)	1,000	10	10	20.0	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.4	17.1	17.1
Biodegraded Mass (g)	0.96	0.81	4.32	1.15	1.41
Percent Biodegraded (%)		-1.7	75.8	1.1	2.6
Adjusted Percent Biodegraded (%)		-2.3	100.0	1.5	3.5

[00684] Table 4 shows the degradation data after 65 days of degradation process. Figure 2A and 2B show a plot of the degradation data which shows that materials and gloves with the degradation agent degrade faster than a material or glove without the degradation agent.

TABLE 4

	Inculum	Negative	Positive	241A - Untreated Gloves	242A - Treated Gloves
Cumulative Gas Volume (mL)	2761.0	2480.2	10604.2	3035.5	5199.6

Percent CH_4 (%)	46.7	49.7	44.0	34.5	33.3
Volume CH_4 (mL)	1290.1	1232.8	4661.8	1047.8	1730.6
Mass CH_4 (g)	0.92	0.88	3.33	0.75	1.24
Percent CO_2 (%)	40.6	37.7	39.9	48.6	43.0
Volume CO_2 (mL)	1121.9	934.6	4229.4	1474.8	2235.4
Mass CO_2 (g)	2.20	1.84	8.31	2.90	4.39
Sample Mass (g)	1,000	10	10	20.0	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.4	17.1	17.1
Biodegraded Mass (g)	1.29	1.16	4.76	1.35	2.12
Percent Biodegraded (%)		-1.5	78.5	0.3	4.9

[00685] Table 5 shows the degradation data after 120 days of degradation process. Figure 3A and 3B show a plot of the degradation data which shows that materials and gloves with the degradation agent degrade faster than a material or glove without the degradation agent.

TABLE 5

	Inculum	Negative	Positive	241A - Untreated Gloves	242A - Treated Gloves
Cumulative Gas Volume (mL)	3413.4	3220.6	12108.1	4396.7	8060.8
Percent CH_4 (%)	48.0	50.8	45.1	38.4	40.9
Volume CH_4 (mL)	1638.9	1636.3	5461.2	1687.7	3293.2
Mass CH_4 (g)	1.17	1.17	3.90	1.21	2.35
Percent CO_2 (%)	38.9	36.3	38.8	43.1	39.1
Volume CO_2 (mL)	1329.1	1168.6	4697.5	1895.0	3152.4
Mass CO_2 (g)	2.61	2.30	9.23	3.72	6.19
Sample Mass (g)	1,000	10	10	20.0	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.4	17.1	17.1
Biodegraded Mass (g)	1.59	1.50	5.44	1.92	3.45
Percent Biodegraded (%)		-1.0	87.2	1.9	10.9
* Adjusted Percent Biodegraded (%)		-1.2	100.0	2.2	12.5

[00686] Table 6 shows the degradation data after 160 days of degradation process. Figure 4A and 4B show a plot of the degradation data which shows that materials and gloves with the degradation agent degrade faster than a material or glove without the degradation agent.

TABLE 6

	Inculum	Negative	Positive	241A - Untreated Gloves	242A - Treated Gloves

Cumulative Gas Volume (mL)	3899.3	3487.4	12634.1	4966.6	10298.8
Percent CH_4 (%)	49.8	52.6	46.3	41.2	45.5
Volume CH_4 (mL)	1941.8	1835.9	5853.9	2047.2	4690.5
Mass CH_4 (g)	1.39	1.31	4.18	1.46	3.35
Percent CO_2 (%)	38.8	36.9	39.1	42.9	38.4
Volume CO_2 (mL)	1512.9	1285.8	4936.9	2132.9	3954.0
Mass CO_2 (g)	2.97	2.53	9.70	4.19	7.77
Sample Mass (g)	1,000	10	10	20.0	20.0
Theoretical Sample Mass (g)	0.0	8.6	4.4	17.1	17.1
Biodegraded Mass (g)	1.85	1.67	5.78	2.24	4.63
Percent Biodegraded (%)		-2.1	88.9	2.3	16.2
* Adjusted Percent Biodegraded (%)		-2.3	100.0	2.6	18.2

CLAIMS

What is claimed is:

1. A biodegradable elastomeric material formed from a composition comprising:
   a) an acrylonitrile butadiene based rubber;
   b) an alkali stabilizing agent;
   c) a metal oxide crosslinking agent; and
   d) a biodegradation agent,

   wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

2. The biodegradable elastomeric material of claim 1, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

3. The biodegradable elastomeric material of claim 1 or 2, wherein the alkali stabilizer comprises an alkali hydroxide.

4. The biodegradable elastomeric material of any of claims 1 through 3, wherein the alkali stabilizer comprises potassium hydroxide.

5. The biodegradable elastomeric material of claims 1 or 2, wherein the alkali stabilizing agent comprises ammonia.

6. The biodegradable elastomeric material of claim 5, wherein the composition has a pH in the range of from about 8.5 to about 10.5.

7. The biodegradable elastomeric material according to any one of claims 1 to 6, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

8. The biodegradable elastomeric material according to any one of claims 1 to 7, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

9. The biodegradable elastomeric material according to any one of claims 1 to 8, wherein the metal oxide crosslinking agent is zinc oxide or magnesium oxide.

10. The biodegradable elastomeric material according to any one of claims 1 to 9, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile rubber.

11. The biodegradable elastomeric material according to any one of claims 1 to 10, wherein the metal oxide crosslinking agent comprises zinc oxide.

12. The biodegradable elastomeric material according to any one of claims 1 to 11, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

13. The biodegradable elastomeric material of claim 12, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

14. The biodegradable elastomeric material according to any one of claims 1 to 13, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

15. The biodegradable elastomeric material according to any one of claims 1 to 14, wherein the biodegradation agent comprises a carboxylic acid compound.

16. The biodegradable elastomeric material according to any one of claims 1 to 15, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

17. The biodegradable elastomeric material according to claim 15, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

18. The biodegradable elastomeric material according to claim 15, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

19. The biodegradable elastomeric material according to claim 15, wherein the biodegradation agent further comprises a compatibilizing additive.

20. The biodegradable elastomeric material according to claim 15, wherein the biodegradation agent further comprises a carrier resin.

21. The biodegradable elastomeric material according to claim 15, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

22. The biodegradable elastomeric material according to claim 15, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

23. The biodegradable elastomeric material according to claim 15, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

24. The biodegradable elastomeric material according to any one of claims 1 to 23, wherein the elastomeric material is vulcanized.

25. The biodegradable elastomeric material according to any one of claims 1 to 24, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the

carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

26. The biodegradable elastomeric material according to claim 25, wherein the carboxylic acid is ethylene acrylic acid.

27. The biodegradable elastomeric material according to claim 1, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

28. The biodegradable elastomeric material according to claim 1, wherein the biodegradation agent comprises polybutylene succinate.

29. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material is biodegradable under aerobic conditions.

30. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material is biodegradable under anaerobic conditions.

31. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

32. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation

after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

33. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

34. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

35. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

36. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

37. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

38. The biodegradable elastomeric material according to any one of the preceding claims, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

39. A biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising:
    a) an acrylonitrile butadiene based rubber;
    b) an alkali stabilizing agent;
    c) a metal oxide crosslinking agent; and
    d) a biodegradation agent,

    wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

40. The biodegradable elastomeric glove of claim 39, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

41. The biodegradable elastomeric glove of claim 39 or 40, wherein the alkali stabilizer comprises an alkali hydroxide.

42. The biodegradable elastomeric glove of any of claims 39 through 41, wherein the alkali stabilizer comprises potassium hydroxide.

43. The biodegradable elastomeric glove of claims 39 or 40, wherein the alkali stabilizing agent comprises ammonia.

44. The biodegradable elastomeric glove of claim 43, wherein the composition has a pH of from about 8.5 to about 10.5.

45. The biodegradable elastomeric glove according to any one of claims 39 to 44, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

46. The biodegradable elastomeric glove according to any one of claims 39 to 45, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

47. The biodegradable elastomeric glove according to any one of claims 39 to 46, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

48. The biodegradable elastomeric glove according to any one of claims 39 to 47, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

49. The biodegradable elastomeric glove according to any one of claims 39 to 48, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

50. The biodegradable elastomeric glove of claim 49, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

51. The biodegradable elastomeric glove according to any one of claims 39 to 50, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

52. The biodegradable elastomeric glove according to any one of claims 39 to 51, wherein the biodegradation agent comprises a carboxylic acid compound.

53. The biodegradable elastomeric glove according to any one of claims 39 to 52, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

54. The biodegradable elastomeric glove according to claim 53, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

55. The biodegradable elastomeric glove according to claim 53, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

56. The biodegradable elastomeric glove according to claim 53, wherein the biodegradation agent further comprises a compatibilizing additive.

57. The biodegradable elastomeric glove according to claim 53, wherein the biodegradation agent further comprises a carrier resin.

58. The biodegradable elastomeric glove according to claim 53, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

59. The biodegradable elastomeric glove according to claim 53, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

60. The biodegradable elastomeric glove according to claim 53, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

61. The biodegradable elastomeric glove according to any one of claims 39-60, wherein the elastomeric glove material is vulcanized.

62. The biodegradable elastomeric glove according to claim 39, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic

polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

63. The biodegradable elastomeric glove according to claim 39, wherein the biodegradation agent comprises polybutylene succinate.

64. The biodegradable elastomeric glove according to any one of claims 39-60, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

65. The biodegradable elastomeric material according to claim 64, wherein the carboxylic acid is ethylene acrylic acid.

66. The biodegradable elastomeric glove according to any one of claims 39-65, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

67. The biodegradable elastomeric glove according to any one of claims 39-66, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

68. The biodegradable elastomeric glove according to any one of claims 39-67, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

69. The biodegradable elastomeric glove according to any one of claims 39-68, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation

after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

70. The biodegradable elastomeric glove according to any one of claims 39-69, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

71. The biodegradable elastomeric glove according to any one of claims 39-70, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

72. The biodegradable elastomeric glove according to any one claims 39-71, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

73. The biodegradable elastomeric glove according to any one of claims 39-72, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

74. The biodegradable elastomeric glove according to any one of claims 39-73, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

75. The biodegradable elastomeric glove according to any one of claims 39-74, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

76. The biodegradable elastomeric glove according to any one of claims 39-75, wherein the biodegradable elastomeric glove material is unsupported.

77. The biodegradable elastomeric glove according to any one of claims 39-76, wherein the biodegradable elastomeric glove is supported.

78. The biodegradable elastomeric glove according to claim 77, wherein the biodegradable elastomeric glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

79. A biodegradable elastomeric glove, comprising a biodegradable elastomeric glove material formed from a composition comprising:
a) a halogen containing elastomeric polymer comprising polychloroprene; and
b) a biodegradation agent,
wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

80. The biodegradable elastomeric glove of claim 79, wherein the halogen containing polymer is polychloroprene.

81. The biodegradable elastomeric glove of claim 80, wherein the composition further comprises a metal oxide cross linking agent.

82. The biodegradable elastomeric glove of claim 81, wherein the metal oxide cross linking agent is zinc oxide or magnesium oxide.

83. The biodegradable elastomeric glove according to claim 81, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

84. The biodegradable elastomeric glove according to any one of claims 79 to 83, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

85. The biodegradable elastomeric glove of claim 84, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

86. The biodegradable elastomeric glove according to any one of claims 79 to 85, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

87. The biodegradable elastomeric glove according to any one of claims 79 to 86, wherein the biodegradation agent comprises a carboxylic acid compound.

88. The biodegradable elastomeric glove according to any one of claims 79 to 87, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

89. The biodegradable elastomeric glove according to claim 88, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

90. The biodegradable elastomeric glove according to claim 88, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

91. The biodegradable elastomeric glove according to claim 88, wherein the biodegradation agent further comprises a compatibilizing additive.

92. The biodegradable elastomeric glove according to claim 88, wherein the biodegradation agent further comprises a carrier resin.

93. The biodegradable elastomeric glove according to claim 88, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

94. The biodegradable elastomeric glove according to claim 88, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

95. The biodegradable elastomeric glove according to claim 88, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

96. The biodegradable elastomeric glove according to any one of claims 79 to 95, wherein the elastomeric glove material is vulcanized.

97. The biodegradable elastomeric glove according to any one of claims 79 to 95, wherein the elastomeric material further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

98. The biodegradable elastomeric material according to claim 97, wherein the carboxylic acid is ethylene acrylic acid.

99. The biodegradable elastomeric glove according to claim 79, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate,

polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

100. The biodegradable elastomeric glove according to claim 79, wherein the biodegradation agent comprises polybutylene succinate.

101. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

102. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

103. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

104. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

105. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

106. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate

as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

107. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

108. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

109. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

110. The biodegradable elastomeric glove according to any one of claims 79 to 96, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

111. The biodegradable elastomeric glove according to any one of claims 79 to 110, wherein the biodegradable elastomeric glove is unsupported.

112. The biodegradable elastomeric glove according to any one of claims 79 to 110, wherein the biodegradable elastomeric glove is supported.

113. The biodegradable elastomeric glove according to claim 112, wherein the biodegradable elastomeric glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel,

carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

114. A biodegradable elastomeric material, formed from a composition comprising:
   a) a halogen containing elastomeric polymer comprising polychloroprene; and
   b) a biodegradation agent.
   wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric material in the absence of the biodegradation agent.

115. The biodegradable elastomeric material of claim 114, wherein the halogen containing polymer is polychloroprene.

116. The biodegradable elastomeric material of claim 114, wherein the composition further comprises a metal oxide cross linking agent.

117. The biodegradable elastomeric material of claim 116, wherein the metal oxide cross linking agent is zinc oxide or magnesium oxide.

118. The biodegradable elastomeric material according to claim 116, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

119. The biodegradable elastomeric material according to any one of claims 114 to 118, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

120. The biodegradable elastomeric material of claim 119, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

121. The biodegradable elastomeric material according to any one of claims 114 to 120, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

122. The biodegradable elastomeric material according to any one of claims 114 to 121, wherein the biodegradation agent comprises a carboxylic acid compound.

123. The biodegradable elastomeric material according to any one of claims 114 to 122, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

124. The biodegradable elastomeric material according to claim 123, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

125. The biodegradable elastomeric material according to claim 123, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

126. The biodegradable elastomeric material according to claim 123, wherein the biodegradation agent further comprises a compatibilizing additive.

127. The biodegradable elastomeric material according to claim 123, wherein the biodegradation agent further comprises a carrier resin.

128. The biodegradable elastomeric material according to claim 123, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

129. The biodegradable elastomeric material according to claim 123, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

130. The biodegradable elastomeric material according to claim 123, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

131. The biodegradable elastomeric material according to any one of claims 114 to 130, wherein the elastomeric material is vulcanized.

132. The biodegradable elastomeric material according to any one of claims 114 to 130, wherein the composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

133. The biodegradable elastomeric material according to claim 132, wherein the carboxylic acid is ethylene acrylic acid.

134. The biodegradable elastomeric material according to claim 114, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

135. The biodegradable elastomeric material according to claim 114, wherein the biodegradation agent comprises polybutylene succinate.

136. The biodegradable elastomeric material according to any one of claims 114 to 131, wherein the biodegradable elastomeric material is biodegradable under aerobic conditions.

137. The biodegradable elastomeric material according to any one of claims 114 to 132, wherein the biodegradable elastomeric material is biodegradable under anaerobic conditions.

138. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric material after 30 days.

139. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric material after 65 days.

140. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric material after 120 days.

141. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric material after 160 days.

142. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

143. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

144. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

145. The biodegradable elastomeric material according to any one of claims 114 to 137, wherein the biodegradable elastomeric material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

146. A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape;
b. contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former;
c. drying the coagulant coating;
d. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
    i. an acrylonitrile butadiene based rubber;
    ii. an alkali stabilizing agent;
    iii. a metal oxide crosslinking agent; and
    iv. a biodegradation agent,
e. curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

147. The method of claim 146, further comprising before step e) beading a portion of the coating.

148. The method of claim 146, further comprising removing the elastomeric glove material from the glove former.

149. The method of claim 146, further comprising before and/or after step e) the step of leaching to remove coagulant.

150. The method of claim 146, further comprising after leaching to remove the coagulant, beading a portion of the coating.

151. The method of claim 146, wherein the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

152. The method of claim 146, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

153. The method of claim 146, wherein the alkali stabilizer comprises an alkali hydroxide.

154. The method of claim 146, wherein the alkali stabilizer comprises potassium hydroxide.

155. The method of claim 146, wherein the alkali stabilizing agent comprises ammonia.

156. The method of claim 146, wherein the composition has a pH of from about 8.5 to about 10.5.

157. The method of claim 146, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

158. The method of claim 146, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

159. The method of claim 146, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

160. The method of claim 146, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

161. The method of claim 146, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

162. The method of claim 146, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

163. The method of claim 146, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

164. The method of claim 146, wherein the biodegradation agent comprises a carboxylic acid compound.

165. The method of claim 146, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

166. The method of claim 146, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

167. The method of claim 146, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide,

polychloroprene, acrylonitrile butadiene based rubber and any copolymers of said polymers.

168. The method of claim 146, wherein the biodegradation agent further comprises a compatibilizing additive.

169. The method of claim 146, wherein the biodegradation agent further comprises a carrier resin.

170. The method of claim 169, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

171. The method of claim 146, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

172. The method of claim 146, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

173. The method of claim 146, wherein the curing step e) provides a vulcanized elastomeric glove material.

174. The method of claim 146, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

175. The method of claim 174, wherein the carboxylic acid is ethylene acrylic acid.

176. The method according to claim 146, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate,

polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

177. The method according to claim 146, wherein the biodegradation agent comprises polybutylene succinate.

178. The method of claim 146, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

179. The method of claim 146, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

180. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

181. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

182. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

183. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than

the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

184. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

185. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

186. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

187. The method of claim 146, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

188. A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
b. contacting at least a portion of the support material of step a) with a composition comprising
    i. an acrylonitrile butadiene based rubber;
    ii. an alkali stabilizing agent;
    iii. a metal oxide crosslinking agent; and
    iv. a biodegradation agent,

    to provide a first coating of the composition on the support material;
c. allowing the first coating to at least partially set;
d. repeating steps b) and c) in sequence “n” times; wherein “n” is an integer equal to or greater than 1 to provide a supported elastomeric glove material

that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

189. The method of claim 188, further comprising removing the supported elastomeric glove material from the glove former.

190. The method of claim 188, further comprising leaching after step d).

191. The method of claim 188, further comprising after step d) curing the composition.

192. The method of claim 188, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

193. The method of claim 188, wherein the alkali stabilizer comprises an alkali hydroxide.

194. The method of claim 188, wherein the alkali stabilizer comprises potassium hydroxide.

195. The method of claim 188, wherein the alkali stabilizing agent comprises ammonia.

196. The method of claim 188, wherein the composition has a pH of from about 8.5 to about 10.5.

197. The method of claim 188, wherein the acrylonitrile butadiene based rubber is an acrylonitrile butadiene rubber latex.

198. The method of claim 188, wherein the acrylonitrile butadiene based rubber is a carboxylated acrylonitrile butadiene rubber latex.

199. The method of claim 188, wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 5.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

200. The method of claim 188, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

201. The method of claim 188, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, thickener and odorant, or a combination thereof.

202. The method of claim 188, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

203. The method of claim 188, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the acrylonitrile butadiene based rubber.

204. The method of claim 188, wherein the biodegradation agent comprises a carboxylic acid compound.

205. The method of claim 188, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

206. The method of claim 188, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

207. The method of claim 188, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

208. The method of claim 188, wherein the biodegradation agent further comprises a compatibilizing additive.

209. The method of claim 188, wherein the biodegradation agent further comprises a carrier resin.

210. The method of claim 209, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, and acrylic acid with polyolefins, or a combination thereof.

211. The method of claim 188, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

212. The method of claim 188, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

213. The method of claim 188, wherein the curing step e) provides a vulcanized elastomeric glove material.

214. The method of claim 188, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the acrylonitrile butadiene based rubber.

215. The method of claim 214, wherein the carboxylic acid is ethylene acrylic acid.

216. The method of claim 188, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

217. The method of claim 188, wherein the biodegradation agent comprises polybutylene succinate.

218. The method of claim 188, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

219. The method of claim 188, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

220. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

221. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

222. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

223. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

224. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

225. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

226. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

227. The method of claim 188, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

228. The method of claim 188, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

229. A method for producing a biodegradable elastomeric glove, comprising:

   a. providing a glove former having a predetermined size and shape;
   b. contacting at least a surface portion of the glove former with a coagulant to provide at least a partial coagulant coating on the surface portion of the glove former;
   c. drying the coagulant coating;
   d. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
      i. a halogen containing elastomeric polymer comprising polychloroprene, and

ii. a biodegradation agent,

e. curing the coating of step d) to provide an elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

230. The method of claim 229, wherein the halogen containing elastomeric polymer is polychloroprene.

231. The method of claim 229, further comprising before step e) beading a portion of the coating.

232. The method of claim 229, further comprising removing the elastomeric glove material from the glove former.

233. The method of claim 229, further comprising before and/or after step e) the step of leaching to remove coagulant.

234. The method of claim 229, wherein the coagulant comprises calcium nitrate, calcium chloride, acetic acid, or a combination thereof.

235. The method of claim 229, wherein the alkali stabilizing agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

236. The method of claim 229, wherein the alkali stabilizer comprises an alkali hydroxide.

237. The method of claim 229, wherein the composition further comprises a metal oxide crosslinking agent and wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

238. The method of claim 237, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

239. The method of claim 229, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

240. The method of claim 229, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

241. The method of claim 229, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

242. The method of claim 229, wherein the biodegradation agent comprises a carboxylic acid compound.

243. The method of claim 229, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

244. The method of claim 229, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

245. The method of claim 229, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

246. The method of claim 229, wherein the biodegradation agent further comprises a compatibilizing additive.

247. The method of claim 229, wherein the biodegradation agent further comprises a carrier resin.

248. The method of claim 247, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

249. The method of claim 229, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

250. The method of claim 229, wherein the chemo taxis agent comprises a sugar, a coumarin or a furanone.

251. The method of claim 229, wherein the curing step e) provides a vulcanized elastomeric glove material.

252. The method of claim 229, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

253. The method of claim 252, wherein the carboxylic acid is ethylene acrylic acid.

254. The method of claim 229, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

255. The method of claim 229, wherein the biodegradation agent comprises polybutylene succinate.

256. The method of claim 229, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

257. The method of claim 229, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

258. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

259. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

260. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

261. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

262. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

263. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

264. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

265. The method of claim 229, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

266. A method for producing a biodegradable elastomeric glove, comprising:

a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
b. contacting at least a portion of the support material of step a) with a composition comprising
    i. halogen containing elastomeric polymer comprising polychloroprene; and
    ii. a biodegradation agent,

   to provide a first coating of the composition on the support material;
c. allowing the first coating to at least partially set; and
d. repeating steps b) and c) in sequence “n” times; wherein “n” is an integer equal to or greater than 1 to provide a supported elastomeric glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference elastomeric glove material in the absence of the biodegradation agent.

267. The method of claim 266, further comprising at least partially coating a coagulant on the first coating.

268. The method of claim 266, wherein the halogen containing elastomeric polymer is polychloroprene.

269. The method of claim 266, further comprising after step d) curing the coating.

270. The method of claim 269, further comprising removing the supported elastomeric glove material from the glove former.

271. The method of claim 266, wherein the composition comprises a metal oxide crosslinking agent and wherein the metal oxide crosslinking agent is present in an amount of from greater than 0 to about 10.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

272. The method of claim 271, wherein the metal oxide crosslinking agent comprises zinc oxide or magnesium oxide.

273. The method of claim 266, wherein the composition further comprises at least one additive selected from the group consisting of a heat sensitizer, surfactant, vulcanizing agent, inorganic filler, antioxidant, pigment, and odorant.

274. The method of claim 266, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

275. The method of claim 266, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing elastomeric polymer.

276. The method of claim 266, wherein the biodegradation agent comprises a carboxylic acid compound.

277. The method of claim 266, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

278. The method of claim 266, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing elastomeric polymer.

279. The method of claim 266, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

280. The method of claim 266, wherein the biodegradation agent further comprises a compatibilizing additive.

281. The method of claim 266, wherein the biodegradation agent further comprises a carrier resin.

282. The method of claim 281, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

283. The method of claim 266, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

284. The method of claim 266, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

285. The method of claim 266, wherein composition further comprises a carboxylic acid or a derivative thereof and a compound including a divalent or trivalent metal, wherein the carboxylic acid or derivative thereof provides a level of carboxyl groups sufficient to crosslink with the halogen containing elastomeric polymer.

286. The method of claim 285, wherein the carboxylic acid is ethylene acrylic acid.

287. The method of claim 266, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

288. The method of claim 266, wherein the biodegradation agent comprises polybutylene succinate.

289. The method of claim 266, wherein the biodegradable elastomeric glove material is biodegradable under aerobic conditions.

290. The method of claim 266, wherein the biodegradable elastomeric glove material is biodegradable under anaerobic conditions.

291. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 30 days.

292. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 65 days.

293. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 120 days.

294. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference elastomeric glove material after 160 days.

295. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

296. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

297. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

298. The method of claim 266, wherein the biodegradable elastomeric glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

299. The method of claim 266, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

300. A biodegradable thermoplastic material, formed from a composition comprising:

a) a halogen containing thermoplastic polymer comprising polyvinyl chloride;

b) a biodegradation agent; and

c) a plasticizer,

wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic material in the absence of the biodegradation agent.

301. The biodegradable thermoplastic material of claim 300, wherein the halogen containing polymer is polyvinyl chloride.

302. The biodegradable thermoplastic material of claim 300, wherein the plasticizer comprises to Di-isononyl Phthalate, 1-[2-(benzoyloxy)propoxy] propan-2-yl benzoate, or epoxidized soybean oil, or a combination thereof.

303. The biodegradable thermoplastic material of claim 300, wherein the plasticizer is present in an amount of from greater than 0 to about 160.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

304. The biodegradable thermoplastic material according to any one of claims 300 to 305, wherein the composition further comprises at least one additive selected from the group consisting of an inorganic filler, and pigment.

305. The biodegradable thermoplastic material of claim 304, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

306. The biodegradable thermoplastic material according to any one of claims 300 to 305, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

307. The biodegradable thermoplastic material according to any one of claims 300 to 306, wherein the biodegradation agent comprises a carboxylic acid compound.

308. The biodegradable thermoplastic material according to any one of claims 300 to 307, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric

acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

309. The biodegradable thermoplastic material according to claim 308, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

310. The biodegradable thermoplastic material according to claim 308, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

311. The biodegradable thermoplastic material according to claim 308, wherein the biodegradation agent further comprises a compatibilizing additive.

312. The biodegradable thermoplastic material according to claim 308, wherein the biodegradation agent further comprises a carrier resin.

313. The biodegradable thermoplastic material according to claim 308, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

314. The biodegradable thermoplastic material according to claim 308, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

315. The biodegradable thermoplastic material according to claim 308, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

316. The biodegradable thermoplastic material according to 300, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic

polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

317. The biodegradable thermoplastic material according to 300, wherein the biodegradation agent comprises polybutylene succinate.

318. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material is biodegradable under aerobic conditions.

319. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material is biodegradable under anaerobic conditions.

320. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic material after 30 days.

321. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic material after 65 days.

322. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic material after 120 days.

323. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic material after 160 days.

324. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

325. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

326. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

327. The biodegradable thermoplastic material according to any one of claims 300 to 317, wherein the biodegradable thermoplastic material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

328. A method for producing a biodegradable thermoplastic glove, comprising:

a. providing a glove former having a predetermined size and shape;
b. coating the glove former having the dried at least partial coagulant coating on the surface thereof with a composition comprising
    i. a halogen containing thermoplastic polymer comprising polyvinyl chloride, and
    ii. a biodegradation agent,

c. curing the coating of step b) to provide an thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

329. The method of claim 328, the method can further comprise before step c) beading a portion of the coating.

330. The method of claim 328, the method can further comprise removing the thermoplastic glove material from the glove former.

331. The method of claim 328, wherein the halogen containing thermoplastic polymer is polyvinyl chloride.

332. The method of claim 328, wherein the composition further comprises a plasticizer.

333. The method of claim 328, wherein the composition further comprises at least one additive selected from the group consisting of a inorganic filler, antioxidant, pigment, and odorant, or a combination thereof.

334. The method of claim 328, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

335. The method of claim 328, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

336. The method of claim 328, wherein the biodegradation agent comprises a carboxylic acid compound.

337. The method of claim 328, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

338. The method of claim 328, wherein the biodegradation agent further comprises a microbe capable of digesting the acrylonitrile butadiene based rubber.

339. The method of claim 328, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

340. The method of claim 328, wherein the biodegradation agent further comprises a compatibilizing additive.

341. The method of claim 328, wherein the biodegradation agent further comprises a carrier resin.

342. The method of claim 341, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

343. The method of claim 328, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

344. The method of claim 328, wherein the chemo taxis agent comprises a sugar, a coumarin, or a furanone.

345. The method of claim 328, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

346. The method of claim 328, wherein the biodegradation agent comprises polybutylene succinate.

347. The method of claim 328, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

348. The method of claim 328, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

349. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

350. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

351. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

352. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

353. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

354. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

355. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

356. The method of claim 328, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

357. A method for producing a biodegradable thermoplastic glove, comprising:
   a. providing a glove former having a predetermined size and shape and being at least partially lined with a support material;
   b. contacting at least a portion of the support material of step a) with a composition comprising
      i. halogen containing thermoplastic polymer comprising polyvinyl chloride;
      ii. a plasticizer; and
      iii. a biodegradation agent,

   to provide a first coating of the composition on the support material;
   c. allowing the first coating to at least partially set; and
   d. repeating steps b) and c) in sequence "n" times; wherein "n" is an integer equal to or greater than 1 to provide a supported thermoplastic glove material that exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

358. The method of claim 357, wherein the composition further comprises a plasticizer.

359. The method of claim 357, wherein the halogen containing thermoplastic polymer is polyvinyl chloride.

360. The method of claim 357, further comprising after step d) curing the coating.

361. The method of claim 357, further comprising removing the supported thermoplastic glove material from the glove former.

362. The method of claim 357, wherein the composition further comprises at least one additive selected from the group consisting of an inorganic filler, and pigment.

363. The method of claim 357, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

364. The method of claim 357, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

365. The method of claim 357, wherein the biodegradation agent comprises a carboxylic acid compound.

366. The method of claim 357, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

367. The method of claim 357, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

368. The method of claim 266, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl

acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

369. The method of claim 357, wherein the biodegradation agent further comprises a compatibilizing additive.

370. The method of claim 357, wherein the biodegradation agent further comprises a carrier resin.

371. The method of claim 370, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

372. The method of claim 357, wherein the biodegradation agent further comprises a chemotaxis agent to attract microbes.

373. The method of claim 357, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

374. The method of claim 357, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

375. The method of claim 357, wherein the biodegradation agent comprises polybutylene succinate.

376. The method of claim 357, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

377. The method of claim 357, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

378. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

379. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

380. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

381. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

382. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

383. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

384. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

385. The method of claim 357, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

386. The method of claim 357, wherein the support material is selected from the group consisting of cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

387. A biodegradable thermoplastic glove, comprising a biodegradable thermoplastic glove material formed from a composition comprising:

a) a halogen containing thermoplastic polymer comprising polyvinyl chloride; and

b) a biodegradation agent,

wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 testing standard that is greater than that of a substantially identical reference thermoplastic glove material in the absence of the biodegradation agent.

388. The biodegradable thermoplastic glove of claim 387, wherein the composition further comprises a plasticizer.

389. The biodegradable thermoplastic glove of claim 387, wherein the halogen containing polymer is polyvinyl chloride.

390. The biodegradable thermoplastic glove according to any one of claims 387 to 389, wherein the composition further comprises at least one additive selected from the group consisting of a inorganic filler, and pigment.

391. The biodegradable thermoplastic glove of claim 390, wherein the composition comprises an inorganic filler present in an amount of from greater than 0 to about 20.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

392. The biodegradable thermoplastic glove according to any one of claims 387 to 391, wherein the biodegradation agent is present in an amount of from greater than 0 to about 2.0 parts per 100 dry parts of the halogen containing thermoplastic polymer.

393. The biodegradable thermoplastic glove according to any one of claims 387 to 392, wherein the biodegradation agent comprises a carboxylic acid compound.

394. The biodegradable thermoplastic glove according to any one of claims 387 to 393, wherein the biodegradation agent comprises a chemo attractant compound; a glutaric acid or its derivative; a carboxylic acid compound with chain length from 5-18 carbons; a polymer; and a swelling agent.

395. The biodegradable thermoplastic glove according to claim 394, wherein the biodegradation agent further comprises a microbe capable of digesting the halogen containing thermoplastic polymer.

396. The biodegradable thermoplastic glove according to claim 394, wherein said polymer comprised in the biodegradation agent is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, polyethylene, polypropylene, polystyrene, polyterephthalate, polyesters, polyvinyl chloride, methacrylate, nylon 6, polycarbonate, polyamide, polychloroprene, acrylonitrile butadiene based rubber, and any copolymers of said polymers.

397. The biodegradable thermoplastic glove according to claim 394, wherein the biodegradation agent further comprises a compatibilizing additive.

398. The biodegradable thermoplastic glove according to claim 394, wherein the biodegradation agent further comprises a carrier resin.

399. The biodegradable thermoplastic glove according to claim 394, wherein said carrier resin is selected from the group consisting of: polydivinyl benzene, ethylene vinyl acetate copolymers, maleic anhydride, acrylic acid with polyolefins.

400. The biodegradable thermoplastic glove according to claim 394, wherein biodegradation agent further comprises a chemotaxis agent to attract microbes.

401. The biodegradable thermoplastic glove according to claim 394, wherein the chemotaxis agent comprises a sugar, a coumarin, or a furanone.

402. The method of claim 387, wherein the biodegradation agent comprises a biodegradable polymer comprising polylactic acid, poly(lactic-co-glycolic acid), polypolypropylene carbonate, polycaprolactone, polyhydroxyalkanoate, chitosan, gluten, and one or more aliphatic/aromatic polyesters such as polybutylene succinate, polybutylene succinate-adipate, polybutylene succinate-sebacate, or polybutylene terephthalate-coadipate, or a mixture thereof.

403. The method of claim 387, wherein the biodegradation agent comprises polybutylene succinate.

404. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material is biodegradable under aerobic conditions.

405. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material is biodegradable under anaerobic conditions.

406. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate

as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days at least 200% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 30 days.

407. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days at least 300% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 65 days.

408. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days at least 500% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 120 days.

409. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days at least 700% greater than the percent biodegradation of the corresponding reference thermoplastic glove material after 160 days.

410. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 30 days of at least at least about 3%

411. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 65 days of at least at least about 4%.

412. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate

as measured according to an ASTM D5511 characterized by a percent biodegradation after 120 days of at least at least about 10%.

413. The biodegradable thermoplastic glove according to any one of claims 387 to 403, wherein the biodegradable thermoplastic glove material exhibits a biodegradation rate as measured according to an ASTM D5511 characterized by a percent biodegradation after 160 days of at least at least about 15%.

414. The biodegradable thermoplastic glove according to any one of claims 387 to 413, wherein the biodegradable thermoplastic glove is unsupported.

415. The biodegradable thermoplastic glove according to any one of claims 387 to 413, wherein the biodegradable thermoplastic glove is supported.

416. The biodegradable thermoplastic glove according to claim 415, wherein the biodegradable thermoplastic glove is supported by a material comprising cotton, nylon, polyester, recycled polyethylene terephthalate (PET), acrylic, lycra, bamboo, steel, carbon fiber, fiberglass, meta and para-aramids (Kevlar®, Twaron®, Nomex®), or ultra-high-molecular-weight-polyethylene, or a combination thereof.

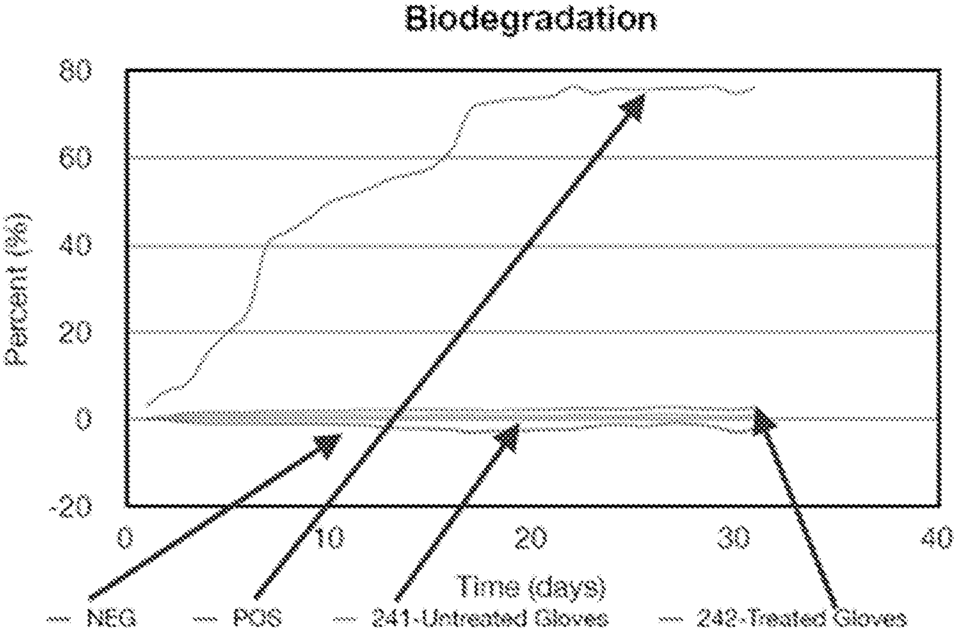
Biodegradation
80
60
40
20
0
-20
Percent (%)
0
10
20
30
40
Time (days)
NEG
POS
241-Untreated Gloves
242-Treated Gloves

FIG 1A

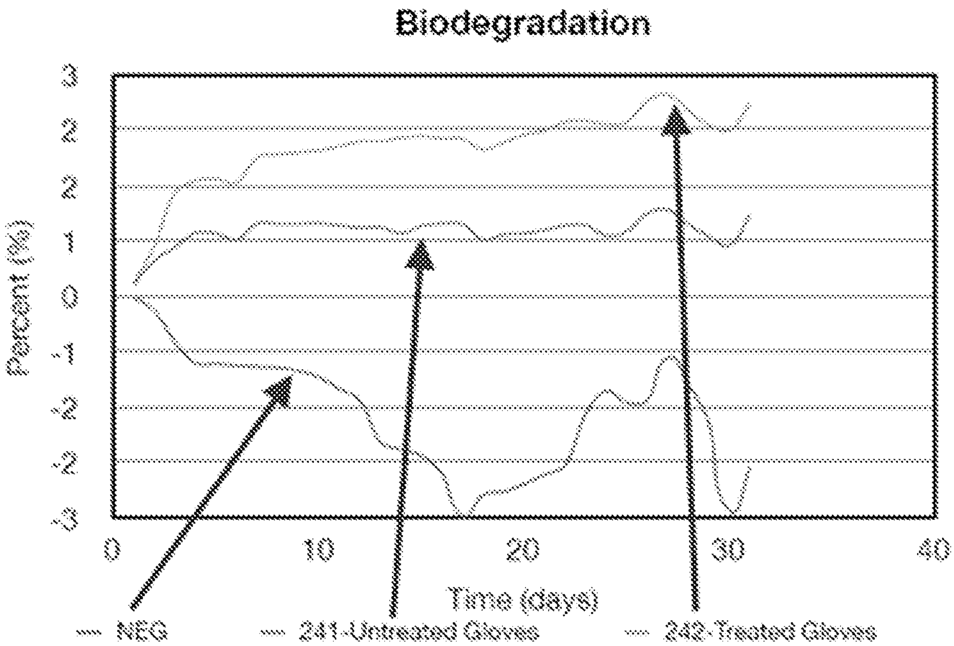
Biodegradation
3
2
2
1
0
-1
-2
-2
-3
Percent (%)
0
10
20
30
40
Time (days)
NEG
241-Untreated Gloves
242-Treated Gloves

FIG. 1B

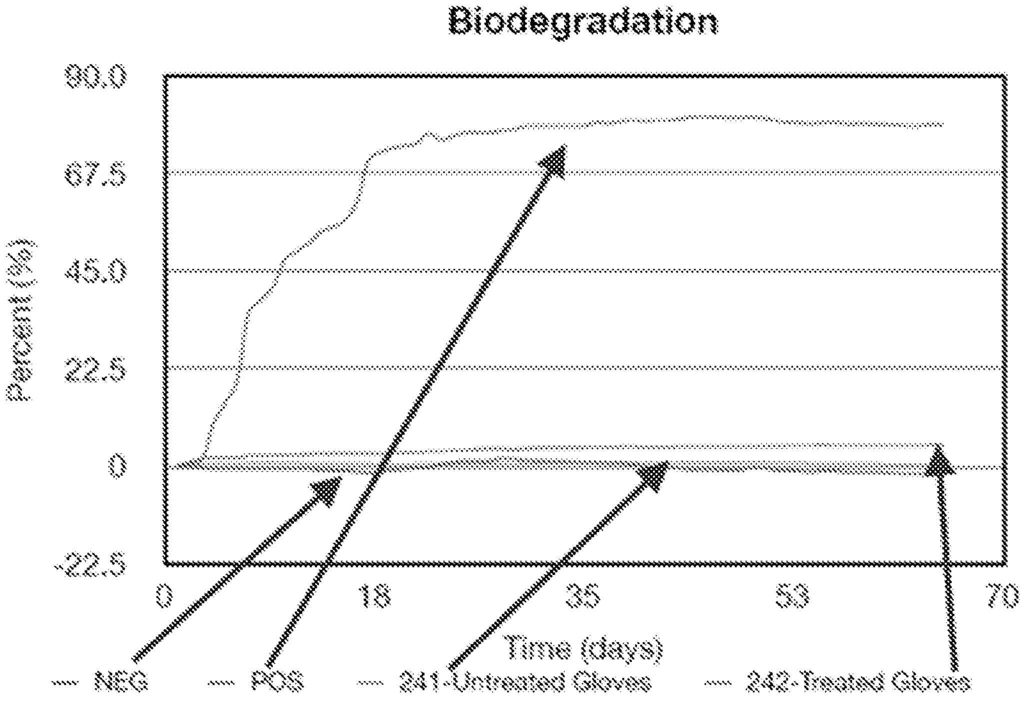
Biodegradation
90.0
67.5
45.0
22.5
0
-22.5
Percent (%)
0
18
35
53
70
Time (days)
NEG
POS
241-Untreated Gloves
242-Treated Gloves

FIG. 2 A

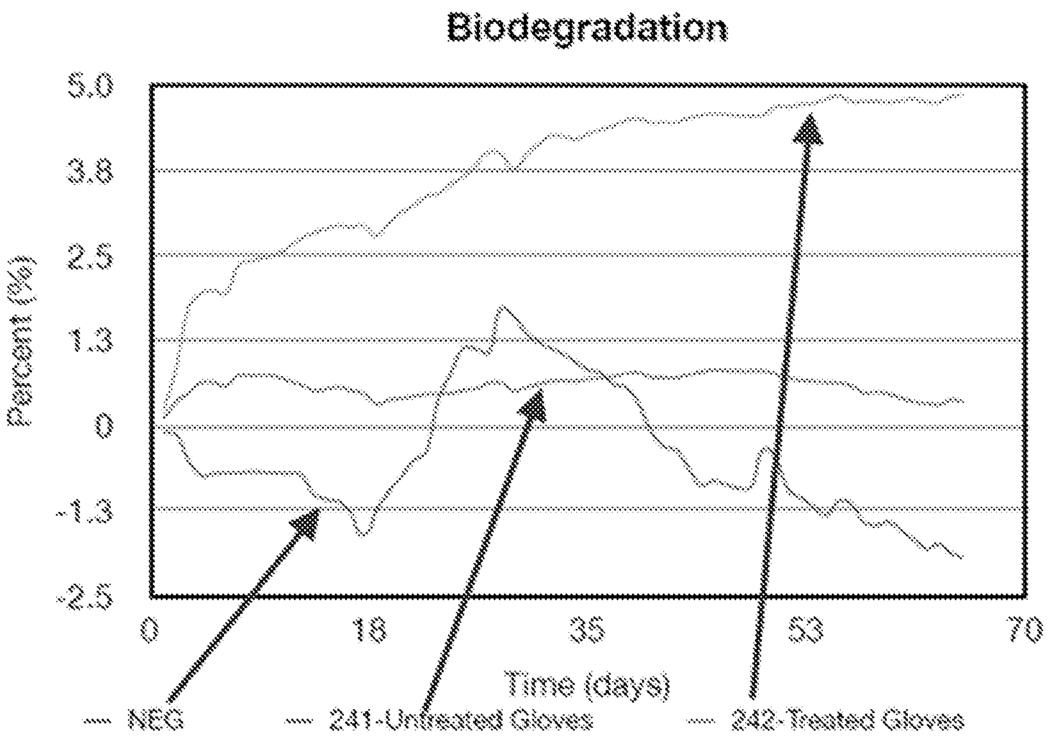
Biodegradation
5.0
3.8
2.5
1.3
0
-1.3
-2.5
Percent (%)
0
18
35
53
70
Time (days)
NEG
241-Untreated Gloves
242-Treated Gloves

FIG. 2B

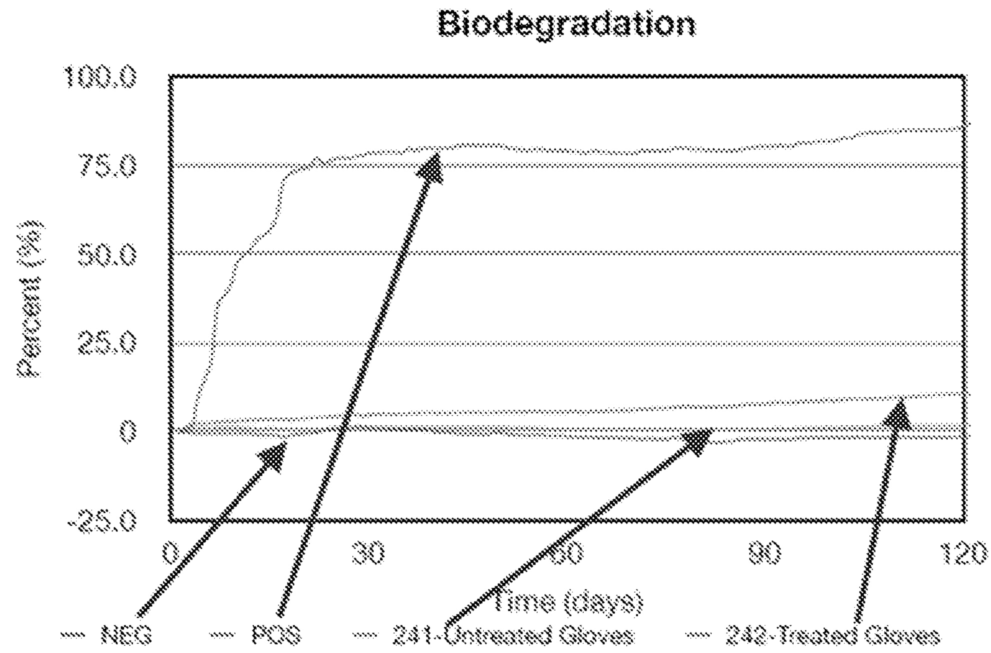
Biodegradation
100.0
75.0
50.0
25.0
0
-25.0
Percent (%)
0
30
60
90
120
Time (days)
NEG
POS
241-Untreated Gloves
242-Treated Gloves

FIG. 3A

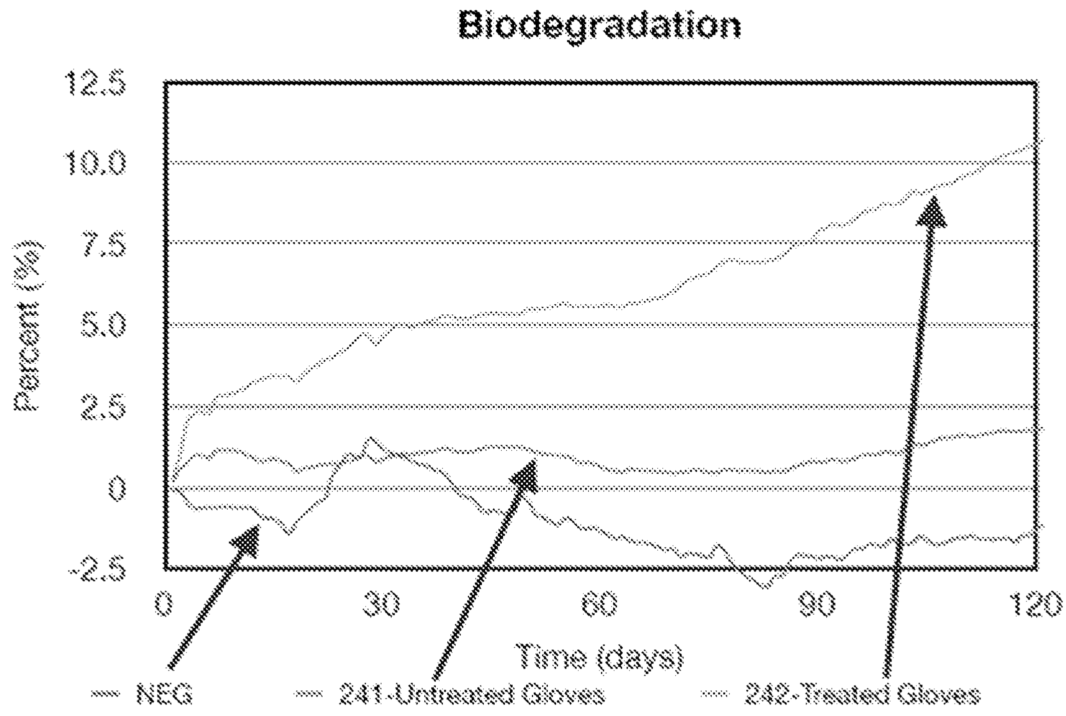
Biodegradation
12.5
10.0
7.5
5.0
2.5
0
-2.5
Percent (%)
0
30
60
90
120
Time (days)
NEG
241-Untreated Gloves
242-Treated Gloves

FIG 3B

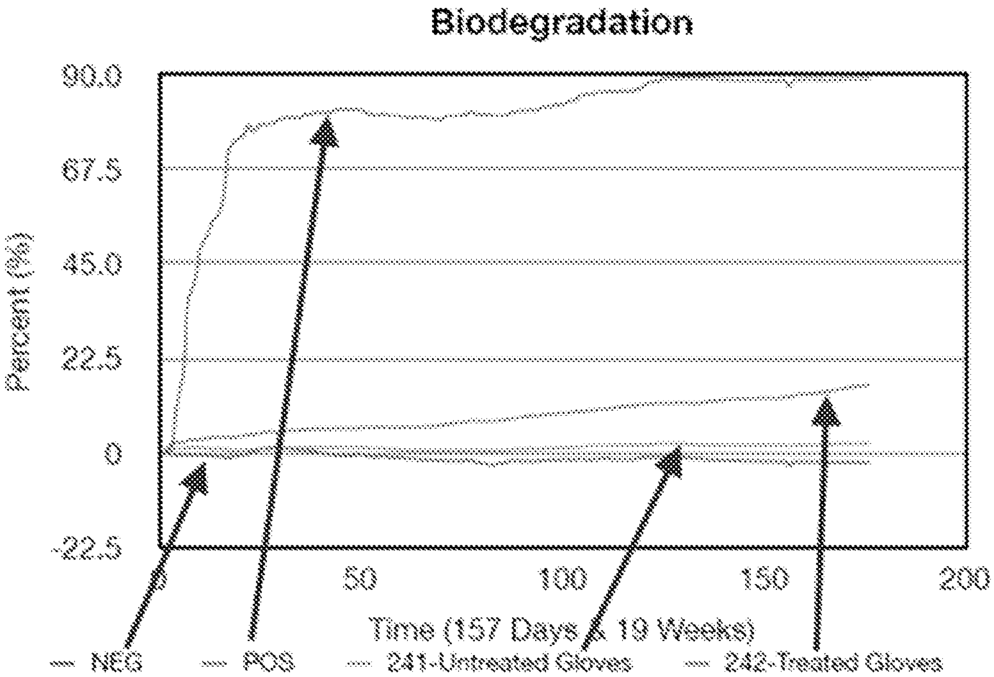
Biodegradation
90.0
67.5
45.0
22.5
0
-22.5
Percent (%)
0
50
100
150
200
Time (157 Days & 19 Weeks)
NEG
POS
241-Untreated Gloves
242-Treated Gloves

FIG 4A

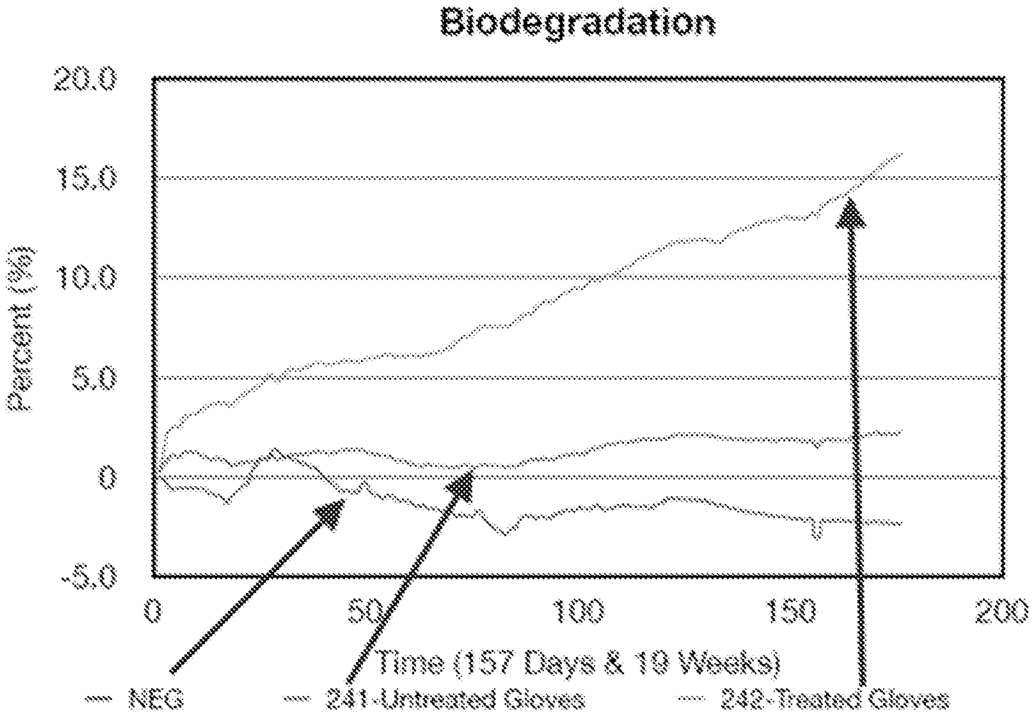
Biodegradation
20.0
15.0
10.0
5.0
0
-5.0
Percent (%)
0
50
100
150
200
Time (157 Days & 19 Weeks)
NEG
241-Untreated Gloves
242-Treated Gloves

FIG. 4B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2013/057316

A. CLASSIFICATION OF SUBJECT MATTER
INV. C08K5/00 A41D19/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
C08K A41D C08L C08J A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/275111 A1 (GROSSMAN RICHARD F [US]) 5 November 2009 (2009-11-05)	300-306, 308,314, 318-327
Y	paragraph [0014] - paragraph [0015] paragraph [0037] - paragraph [0041] examples 11-15,17-21 paragraph [0086]; examples 44-46 -----	1-416
X	US 2011/159766 A1 (GROSSMAN RICHARD F [US]) 30 June 2011 (2011-06-30)	300-306, 308,314, 318-327
Y	examples 10-14,20-25 paragraph [0032] - paragraph [0033] claim 1 -----	1-416
	-/--	

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 November 2013	19/11/2013

Name and mailing address of the ISA/
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Russell, Graham

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6 706 816 B2 (WILLIAMS WILLIAM ANDRUS [US] ET AL) 16 March 2004 (2004-03-16) cited in the application example 1; table 1	1-416
Y	WO 97/48765 A1 (SIEBE NORTH INC [US]) 24 December 1997 (1997-12-24) example 1 claims 1,11,15,16	1,39, 146,188
Y	US 6 569 375 B1 (MCGLOTHLIN MARK W [US] ET AL) 27 May 2003 (2003-05-27) example 3	79,114, 229,266
Y	WO 2011/068394 A1 (KOSSAN SDN BHD [MY]; SIONG HUI KHOO [MY]; LAWRENCE SIAU TIAN LIN [MY];) 9 June 2011 (2011-06-09) claim 13	1,39, 146,188
A	US 2008/103232 A1 (LAKE JOHN ALLEN [US] ET AL) 1 May 2008 (2008-05-01) cited in the application claims 1-3	1,17,39, 54,79, 89,114, 124,146, 166,188, 206,229, 244,278, 300,309, 328,338, 357,367, 387,395

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/057316

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009275111 A1	05-11-2009	CA 2769626 A1	13-01-2011
		CN 102648236 A	22-08-2012
		EP 2451868 A1	16-05-2012
		US 2009275111 A1	05-11-2009
		WO 2011005446 A1	13-01-2011
US 2011159766 A1	30-06-2011	US 2011159766 A1	30-06-2011
		WO 2012115684 A1	30-08-2012
US 6706816 B2	16-03-2004	EP 1412395 A1	28-04-2004
		GT 200200133 A	06-06-2003
		TW I225445 B	21-12-2004
		US 2003017286 A1	23-01-2003
		US 2004092633 A1	13-05-2004
		WO 03006513 A1	23-01-2003
WO 9748765 A1	24-12-1997	AU 727151 B2	07-12-2000
		AU 3572097 A	07-01-1998
		BR 9709881 A	11-01-2000
		CA 2258814 A1	24-12-1997
		DE 69732778 D1	21-04-2005
		EP 0925329 A1	30-06-1999
		JP 3517246 B2	12-04-2004
		JP 2000512684 A	26-09-2000
		MY 115095 A	31-03-2003
		US 6031042 A	29-02-2000
		WO 9748765 A1	24-12-1997
US 6569375 B1	27-05-2003	AT 355322 T	15-03-2006
		AU 5320701 A	23-10-2001
		AU 2001253207 B2	09-09-2004
		CA 2405723 A1	18-10-2001
		DE 60126926 T2	22-11-2007
		EP 1276792 A2	22-01-2003
		JP 4071498 B2	02-04-2008
		JP 4435805 B2	24-03-2010
		JP 2003530255 A	14-10-2003
		JP 2007301999 A	22-11-2007
		US 6569375 B1	27-05-2003
		US 2003141633 A1	31-07-2003
		US 2004164456 A1	26-08-2004
		WO 0177210 A2	18-10-2001
WO 2011068394 A1	09-06-2011	CN 102725342 A	10-10-2012
		EP 2507313 A1	10-10-2012
		JP 2013508528 A	07-03-2013
		KR 20120099102 A	06-09-2012
		US 2012246799 A1	04-10-2012
		WO 2011068394 A1	09-06-2011
US 2008103232 A1	01-05-2008	AU 2007313630 A1	08-05-2008
		CN 101589097 A	25-11-2009
		EP 2087033 A1	12-08-2009
		JP 5280368 B2	04-09-2013
		JP 2010508425 A	18-03-2010
		JP 2013177623 A	09-09-2013
		US 2008103232 A1	01-05-2008
		US 2013011906 A1	10-01-2013

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2013/057316

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		WO 2008055240 A1	08-05-2008

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