ANTISTATIC GLOVES AND PROCESS FOR MAKING SAME

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Abstract

The present invention is directed to antistatic elastomeric articles and methods of making the same. The articles can be single layered or multilayered. The single layered articles possess desirable antistatic properties and desirable properties of comfort and feel. The multilayered articles have an outermost layer/surface that possesses desirable antistatic properties and an innermost layer/surface that exhibits desirable properties of comfort and feel. In preferred embodiments, the elastomeric articles are made from a nitrile/natural rubber blend. Articles of the present invention have antistatic properties measured as having a surface resistivity below about $10^{14}$ Ω/sq and a static decay time of less than about 60 seconds.
Figure 1

100

Form multilayered latex glove by coagulant dipping 200

Chlorinate multilayered latex glove 300

Wash multilayered latex glove 400
Clean and wash article former

Dry former in oven at 70°C

Dip former into coagulant

Dry coagulant-coated former in oven at 70°C for 3-5 min

Dip former into a first latex composition

Dry 1st composition-coated former in oven at 135°C for 1 min.

Dip former into a second latex composition

Dry 2nd composition-coated former in oven at 70°C for 2 min.

Leach in water at 40°C for 3 min.

Cure in oven at 135°C for 20 min.

Cool former and formed glove

Strip glove off former

Chlorinate glove
Figure 3

**300**

Invert glove

→

Rinse with water for 15 min.

→

Chlorinate glove a first time using 300 ppm chlorine solution for 35min.

→

Rinse with water 5 times, for 15 min. each time

→

Invert glove

→

Rinse with water for 15 min.

→

Chlorinate glove a second time using 300 ppm chlorine solution for 35min.

→

Rinse with water 5 times, for 15 min. each time

→

Wash glove

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Wash glove 400
Rinse with water for 15 min.

Rinse with water at temp. 80 +/- 10°C for 1 hour

Rinse with water for 15 min.

Dry at (1) 80 +/- 10°C for 2 1/2 hrs and (2) at ambient temp. for 30 mins

Wash with de-ionized water 6 times, for 40 min. each time

Spin dry for 15 min.

Dry at (1) 80 +/- 10°C for 2 1/2 hrs and (2) at ambient temp. for 30 mins

Obtain finished glove
ANTISTATIC GLOVES AND PROCESS FOR MAKING SAME

FIELD OF THE INVENTION

[0001] The invention relates to the field of elastomeric articles such as gloves. In particular, the invention pertains to elastomeric gloves that can be used in industrial and medical applications wherein the elastomeric gloves exhibit desirable static resistivity or antistatic properties while retaining desirable softness and feel properties.

BACKGROUND OF THE INVENTION

[0002] Elastomeric articles, such as gloves, are well known in the industrial and medical fields for their ability to form a protective chemical, microbial, and physical barrier between the external environment and the user’s skin. Various physical and chemical properties of gloves, and the elastomers they are made from, are desirable for a variety of applications. In certain fields where articles such as gloves and finger cots are widely used, such as electronic assembly, desirable properties include comfort and softness of feel, maintenance of tactile sensitivity and surface static resistivity.

[0003] The advantages of elastomeric articles such as gloves with antistatic properties are also known. In certain fields such as handling sensitive electronic equipment, the use of gloves and/or finger cots with antistatic properties is mandatory to avoid static discharge that can damage electronic components. Polyvinyl chloride (PVC), acrylonitrile-butadiene (nitrile) and polyurethane rubbers have been used for antistatic gloves.

[0004] The use of natural rubber is associated with good softness and tactile sensitivity properties. However, natural rubber does not exhibit good static resistivity. To compensate for this deficiency, conductive carbon black could be added to natural rubber latex. However, a concern with such a black-colored article is shedding of the conductive black particles which can cause contamination problems. Moreover, carbon black would darken and blacken the resulting article which is aesthetically unappealing and potentially visually distracting to the user and may interfere with the precision of handling instruments.

[0005] U.S. Pat. No. 6,794,475 to Bialke et al. (hereinafter “Bialke et al.”) describes antistatic polymers, blends and articles. Bialke et al. describes polymeric blends containing a macromer-modified latex and a secondary latex. The macromer-modified latex may be an acrylonitrile-based co-polymer and the secondary latex may be natural rubber. Articles formed from these polymeric blends allegedly demonstrate improved electrostatic properties. Specifically, Bialke et al. provides examples of co-polymers of methoxyethylene glycol methacrylate and acrylonitrile used in blended compositions containing one or more latex components having static resistive properties. However, Bialke et al. achieves antistatic properties by modifying a latex component with a macromer and thereby forming co-polymers containing macromers such as methoxyethylene glycol methacrylate. Bialke et al. does not describe blending unmodified latex components, specifically the combination of nitrile rubber latex with natural rubber latex. Nor does Bialke et al. recognize the antistatic properties of such a combination.

[0006] U.S. Pat. No. 5,459,880 to Sakaki et al. (hereinafter “Sakaki et al.”) describes gloves having a plurality of different types of rubbers successively laminated together. Sakaki et al. describes the lowermost layer as being a natural rubber layer and a top surface layer as being an oil-resistant rubber layer, such as a acrylonitrile-butadiene rubber layer. Each of these layers contains only one particular type of latex. Sakaki et al. does not disclose latex layers consisting of a blend of more than one type of latex (e.g., nitrile rubber latex combined with natural rubber latex). In addition, the process described by Sakaki et al. includes forming a lower layer and immersing the lower layer into an additional latex composition immediately thereafter or while the lower layer still contains water so as to improve the adhesion between the layers of different types of latex.

[0007] Problems associated with the manufacture of multilayered articles with different elastomer layers laminated to one another include chemical incompatibility resulting in delamination between layers and difficulty in controlling the amount of water in the latex gel and the degree of latex gelling. When these factors are not properly controlled, the layers may delaminate. To reduce delamination of the layers, Sakaki et al. relies on the ability of the rubber components of both layers to mix with each other at the interface so that the rubber molecules are entangled with one another. Such interfacial mixing could only occur if the first layer is not fully gelled or set (i.e., it is dependent on the degree or extent of gelling or setting of the first layer). The degree of gelling is dependent on the concentration of coagulant, the solids content of the latex, temperature and time, and is therefore difficult to control. Sakaki et al. does not describe increasing the chemical compatibility of two different layers by blending the two different types of latex prior to forming an article and thus reducing delamination.

[0008] There is an in need of the field of elastomeric articles for an improved manufacturing technique which can produce a rubber-containing article that exhibits good antistatic or surface resistivity properties. There is further need for multi-layered rubber-containing articles wherein additional natural rubber layer(s) can be formed that afford the advantage of softness of feel and comfort on the skin-contacting layer while maintaining good adherence between the layers.

SUMMARY OF THE INVENTION

[0009] The present invention encompasses rubber elastomeric articles with desirable static resistivity or antistatic properties and methods of making same. It has been surprisingly discovered that rubber-containing elastomeric articles, e.g., gloves, can be manufactured which exhibit desirable antistatic properties without requiring the addition or incorporation of secondary additives into the process. The present invention provides a balance between maintaining effective and desirable antistatic properties of the outermost surface/layer of the elastomeric article while at the same time affording the user desirable comfort and feel properties on the innermost surface/layer.

[0010] In one embodiment, the elastomeric article comprises a single layer of rubber. In such embodiments, a non-leachable polymeric antistatic agent with desirable antistatic properties is blended with an elastomeric material with desirable comfort and feel properties. It is the inventors’ surprising discovery that an elastomeric article made from such a blend exhibits surface resistivity and static decay properties that are more similar to those of an article made from a non-leachable polymeric antistatic agent than a weighted average would predict. In a preferred embodiment, the non-leachable polymeric antistatic agent comprises about 80% w/w and the
elastomeric material comprises about 20% w/w. In another preferred embodiment, the non-leachable polymeric antistatic agent is nitrile rubber or polyurethane and the elastomeric material is natural rubber or polysoprene.

[0011] In another embodiment, the elastomeric article comprises more than one layer of rubber. In such embodiments, the outermost layer of the article is composed of a majority of a non-leachable polymeric antistatic agent with desirable antistatic properties. The innermost layer of the article is composed of a majority of an elastomeric material with desirable comfort and feel properties. Each layer comprises a minor amount of the polymer that is the major component in the adjacent layer. In a preferred embodiment, the non-leachable polymeric antistatic agent is nitrile rubber or polyurethane and the elastomeric material is natural rubber or polysoprene.

[0012] The invention also provides for an improved manufacturing process for multilayered rubber-containing elastomeric articles such as gloves. It has further surprisingly been discovered that advantageous interlayer adherence based on chemical compatibility can be accomplished by mutually combining minor amounts of latex of adjacent layers into the predominant latex of each. It has also been found that strong interlayer adherence results can be accomplished for antistatic rubber-containing articles while at the same time achieving good tactile sensitivity of the article. The present invention provides a balance between chemical compatibility and adherence between multiple layers of differing compositions of rubbers and substantially maintains the effective and desirable antistatic properties of the outermost layer while at the same time affording the user the desirable comfort and feel properties associated with the innermost layer.

[0013] In a specific embodiment, a multilayered elastomeric article of the invention is made by the process comprising: a) preparing a first blended latex composition for the outermost layer by mixing a major amount of the non-leachable polymeric antistatic agent with a minor amount of the elastomeric material; b) preparing a second blended latex composition for the innermost layer by mixing a minor amount of the non-leachable polymeric antistatic agent with a major amount of the elastomeric material; wherein said mixing is performed prior to the latex gelling; and c) forming a molded article wherein one layer is formed from said first blended latex composition and a directly adjacent layer is formed from said second blended latex composition. In more specific embodiments, the major polymer component in each layer comprises about 80% w/w and the minor polymer component comprises about 20% w/w.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 illustrates an exemplary embodiment of a process for making a multilayered latex molded article.

[0015] FIG. 2 illustrates an exemplary embodiment of a process for forming a multilayered latex molded article.

[0016] FIG. 3 illustrates an exemplary embodiment of a process for chlorinating a multilayered latex molded article.

[0017] FIG. 4 illustrates an exemplary embodiment of a process for washing a chlorinated multilayered latex molded article.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The elastomeric articles of the present invention display desirable antistatic properties while also having desirable comfort and feel. In one embodiment, the elastomeric articles of the present invention display desirable antistatic properties on the outermost surface and/or layer of the article while having desirable comfort and feel properties on the innermost skin-contacting surface/layer of the article. This is accomplished by using blends of polymers that each have desirable properties, e.g., good surface resistivity and static decay times (i.e., non-leachable polymeric antistatic agent) and good comfort and feel properties (i.e., elastomeric material). In one embodiment, the blended polymers are used to make a single layer elastomeric article. In another embodiment, the blended polymers are used to make a multilayer elastomeric article. In such embodiments, the outermost surface/layer is comprised of a majority of the non-leachable polymeric antistatic agent with a minor amount of the elastomeric material. The innermost surface/layer is comprised of a majority of the elastomeric material with a minor amount of the non-leachable polymeric antistatic agent.

[0019] As used herein, the term “antistatic” as used to define the properties associated with the inventive elastomeric articles refers to a material having a surface resistivity of about $10^5 \Omega$ sq to about $10^8 \Omega$ sq (as measured according to ASTM D257-99) and a static decay time of less than about 60 seconds (as measured by MIL-STD-3010A Test Method 4046—Electrostatic Properties). Surface resistivity and volume resistivity are as defined in ASTM D257 and are measured at a relative humidity of 12% to 3% and a temperature of 22°C ± 2°C. Static decay time (SDT) is as defined in MIL-PRF-81705D. The surface resistivity, volume resistivity, and SDT of each glove sample were determined by averaging the values measured for three pieces (specimens) of each glove sample.

[0020] Ultimate elongation and modulus at 500% elongation are defined and measured in accordance with ASTM D4141-98a.

[0021] As used herein, the term “major” or “majority” with respect to the overall composition of rubber is meant to indicate an ingredient that is present in an amount greater than the combination of remaining ingredients within the given composition. As used herein, the terms “minor” or “minority” with respect to the overall composition of rubber is meant to indicate an ingredient that is present in an amount that is less than the amount of at least one other ingredient within the given composition.

[0022] The antistatic elastomeric articles of the present invention with desirable surface resistivity and static decay times are particularly useful in applications where control of static electricity is important, such as in computer and electronic assembly techniques. While any elastomeric article can be made using the methods of the present invention, in preferred embodiments, the elastomeric articles are gloves or finger cots.

[0023] The elastomeric articles of the invention are made from blends of non-leachable polymeric antistatic agents with desirable surface resistivity and static decay times and elastomeric materials with desirable comfort and feel properties in either a single layer or multilayer form. Non-leachable polymeric antistatic agents can be both ionic (e.g., polyelectrolyte and quaternary polyelectrolytes) and nonionic (e.g., nitrile rubber and polyvinyl chloride). Examples of non-leachable polymeric antistatic agents with desirable surface resistivity and static decay times include, but are not limited to, nitrile rubber, polysulfane, polyvinyl chloride, epichlorohydrin rubber, EPDM-polyaniline copolymer, polyether, polyalky-
lene oxide, polyalkylene glycol, polybetaine, polyacetylene, polyamline, copolyesteramide, polyetheramide, polyetheresteramide block copolymer, polythiophene, polyparaphenylene, polyvinyl carbazole, polyglycol diglycidyl ether, polypyrrole, polyfuran, polybenzene, polyphenylene sulfide, salts of polycrylic acid, polymer electrolyte/ionomers, quarternary polysalts, and ammonium polyphosphate. Examples of elastomeric materials with desirable comfort and feel properties include, but are not limited to, natural rubber, polyisoprene, polychloroprene, plasticized polyvinyl chloride, polybutadiene, butyl rubber, EPDM, polyacrylic rubber, polyurethane, halogenated butyl rubber, and styrene-containing block copolymers (e.g., SIS, SEBS). In preferred embodiments, the non-leachable polymeric antistatic agent is nitrile rubber or polyurethane and the elastomeric material is natural rubber or polyisoprene.

[0024] The art will appreciate that “nitrite rubber” is a broad class of polymers, and that nitrile rubber compositions may be greatly varied. One embodiment of the present invention contemplates the use of carboxylated nitrile rubber latex. Another embodiment of the present invention contemplates the use of carboxylated nitrile rubber latex composed of between about 25% and about 40% acrylonitrile, between about 54% and about 73% butadiene and between about 2% and about 6% carboxylic acid. In another embodiment of the present invention, the carboxylic acid is methacrylic acid. In yet another embodiment of the present invention, the carboxylated nitrile rubber latex is composed of about 39% acrylonitrile, about 58% butadiene, and about 3% carboxylic acid. In yet another embodiment of the present invention, the carboxylated nitrile rubber latex is composed of about 39% acrylonitrile, about 55% butadiene, and about 6% carboxylic acid. These illustrative embodiments are in no way intended to limit to the recited compositions the scope of nitrile rubber contemplated for use in the present invention.

[0025] The art will appreciate that “polyurethane” is a broad class of polymers, and that polyurethane compositions may be greatly varied to achieve varying physical properties. Thus, polyurethanes may broadly be characterized as “polymeric antistatic agents” and/or “elastomeric materials”, depending on their chemical composition and desired physical properties. For example, a polyurethane made from a polyester diol, an amine-based chain extender, and a neutralized ionomer may be expected to possess antistatic properties. One of ordinary skill in the art would be able to vary the composition of a polyurethane to achieve a polymer with antistatic properties and/or desirable comfort and feel properties, although the inventors believe that the same polyurethane will likely not serve as both components of a single embodiment of the composition. That is, one of ordinary skill in the art would be able to select a particular polyurethane either as a suitable polymeric antistatic agent based on its conductivity or as a suitable elastomeric material based on its desirable comfort and feel properties. The above example in no way limits the scope of polyurethanes contemplated for use in the present invention.

[0026] When making a single layer elastomeric article of the invention or the outer layer of a multilayer elastomeric article of the invention, a polymer blend containing a major amount of a non-leachable polymeric antistatic agent and a minor amount of elastomeric material is used. The blend is used to manufacture the entire single layer article or to manufacture the outermost layer of the multilayered article. Any means of blending can be used, including, but not limited to, solvent-based blending, melting block blending and latex blending. In one embodiment, the latex composition for the blend comprises a non-leachable polymeric antistatic agent in an amount from about 51% to about 95%, and an elastomeric material in an amount of from about 49% to about 5% of the total blended latex composition. Preferably, the latex composition for the blend comprises a non-leachable polymeric antistatic agent in an amount from about 60% to about 90%, and an elastomeric material in an amount of from about 40% to about 10% of the total blended latex composition. More preferably, the latex composition for the blend comprises a non-leachable polymeric antistatic agent in an amount from about 65% to about 85%, and an elastomeric material in an amount of from about 35% to about 15% of the total blended latex composition. In a specific embodiment, the latex composition for the blend comprises a non-leachable polymeric antistatic agent in an amount of about 80%, and an elastomeric material in an amount of about 20% of the total blended latex composition. The non-leachable polymeric antistatic agent component may be a single polymer or may itself be a blend of more than one non-leachable polymeric antistatic agent. Similarly, the elastomeric material component may be a single polymer or a blend of more than one elastomeric material.

[0027] In embodiments where a multilayered elastomeric article is made, the innermost skin-contacting layer of the article may be comprised of a majority of an elastomeric material with desirable comfort and feel properties. Thus, the latex composition used to prepare the innermost layer may be comprised of an elastomeric material in an amount from about 51% to about 95%, and a non-leachable polymeric antistatic agent in an amount of from about 49% to about 5% of the total blended latex composition. Preferably, the innermost layer latex composition may be comprised of an elastomeric material in an amount from about 60% to about 90%, and a non-leachable polymeric antistatic agent in an amount of from about 40% to about 10% of the total blended latex composition. More preferably, the innermost layer latex composition may be comprised of an elastomeric material in an amount from about 65% to about 85%, and a non-leachable polymeric antistatic agent in an amount of from about 35% to about 15% of the total blended latex composition. In a specific embodiment, the innermost layer latex composition may be comprised of an elastomeric material in an amount of about 80%, a non-leachable polymeric antistatic agent in an amount of about 20% of the total blended latex composition. The non-leachable polymeric antistatic agent component may be a single polymer or may itself be a blend of more than one non-leachable polymeric antistatic agent. Similarly, the elastomeric material component may be a single polymer or a blend of more than one elastomeric material.

[0028] It is desirable that the antistatic elastomeric articles of the invention have a surface resistivity preferably less than about $10^{10}$ $\Omega$/sq, more preferably less than about $8\times10^{8}$ $\Omega$/sq, and most preferably less than about $5\times10^{8}$ $\Omega$/sq. It is also desirable that the antistatic elastomeric articles of the invention have a static decay time preferably less than about 60 seconds, more preferably less than about 40 seconds, and most preferably less than about 30 seconds. It is also desirable that the antistatic elastomeric articles of the invention have a
modulus at 500% elongation preferably less than about 10 MPa, more preferably less than about 7 MPa, and most preferably less than about 5 MPa.

Process of Making Antistatic Gloves

[0029] In embodiments where the elastomeric article is a single layer glove, any known method in the art can be used to make the glove providing that the polymer blends described above are used. For example, the single latex dip used for single layer gloves is described in D. C. Blackley, Chapter 17 “Latex-dipping processes” in Polymer Latices: Science and Technology 2nd edition Volume 3, Chapman & Hall London 1997 (incorporated by reference in its entirety).

[0030] In embodiments where the elastomeric article is a multilayered glove, a standard coagulant dipping process well known to be used in the manufacture of medical examination and surgical gloves can be used. The standard process can be readily modified to apply multiple latex dips as compared to the ordinary single latex dip used for single layer gloves (D. C. Blackley, supra).

[0031] The process may be illustrated according to the following non-limiting example of preparing an antistatic glove. To prepare an antistatic glove according to the invention, a first latex blend composition of a majority of a non-leachable polymeric antistatic agent (e.g., nitrile rubber) and a second latex blend composition of a majority an elastomeric material (e.g., natural rubber) are prepared. The first latex blend composition comprises a blend of a non-leachable polymeric antistatic agent (e.g., nitrile rubber) and an elastomeric material (e.g., natural rubber), wherein the former polymer comprises a majority of the first latex blend composition. The second latex blend composition comprises a blend of the same polymers described above, however, the elastomeric material comprises a majority of the second latex blend composition. A clean latex article former (e.g., a mold) is dipped into a coagulant solution and heat dried. Subsequently, the coagulant-coated former is dipped into the first latex blend composition. The latex film on the former is then coagulated by the coagulant to form a gel and complete setting of the gel is aided by heat (heat gelation) which also partially dries the gel. The gelled rubber covered former is dipped into the second latex blend composition and subsequently heat gelled and dried.

[0032] In embodiments where the elastomeric article has more than two layers, it is made by successively laminating one layer on top of another by dipping into the latex composition (and coagulant if necessary).

[0033] The multilayered latex article is then leached in water, heat dried and vulcanized to cure the article. After the curing step, the multilayered latex article is leached in water a second time. Lastly, the multilayered latex article is cooled and removed from the former. The gloves are inverted when removed from the former so as to orient the layer containing a majority of the elastomeric material toward the inner skin-contacting surface of the wearer and the layer containing a majority of the non-leachable polymeric antistatic agent toward the exterior environment. Variations of the basic process can be made. For example, the gloves may be beaded in an additional step after latex gelling and before the leaching step.

[0034] The donnability of the gloves may be enhanced by a chlorination step. The chlorination step may be used to produce a powder-free article. A powder-free glove as used herein is as defined in ASTM D6124 and has a powder residue limit of 2.0 mg/glove tested according to ASTM D6124. The chlorination step is interposed between the post cure leaching and removal of the gloves from the former. In one particular embodiment, the removed gloves are turned inside out in a clean room environment to orient the skin-contacting layer toward the exterior of the gloves. The gloves are washed, chlorinated, and thoroughly washed again with clean water. The gloves are then dried, manually inverted, and dried a second time. Once the gloves have been dried a second time, they are then packaged. The techniques and equipment for the process are conventional and readily available to one skilled in the glove manufacturing field.

[0035] The antistatic gloves of the present invention provide the desirable properties of both of the polymers in the polymer blend (e.g., the antistatic properties of the non-leachable polymeric antistatic agent and the desirable comfort and feel properties of the elastomeric material). The desirable static decay time and surface resistivity values associated with the non-leachable polymeric antistatic agent are substantially maintained in the outermost layer/surface of gloves prepared according to the process described herein. The multilayer latex antistatic gloves also demonstrate improved delamination resistance due to chemical compatibility between the layers, and also provide the desirable soft feel simulating natural rubber for the innermost skin-contacting layer/surface.

[0036] Another advantage of the antistatic gloves and the process for making multilayered articles described herein is that laminating of the layers is based on the chemical compatibility of the first latex composition and the second latex composition and does not rely on the extent of gelation and the amount of water present in an intermediate latex gel. This allows for an easily controlled and more reliable laminating of the multilayered gloves and provides an improvement over the difficult and uncertain methods previously available.

[0037] An important aspect of the process described herein includes pre-blending the latex compositions, i.e., mechanically mixing the ingredients prior to latex coagulation or gelling. The pre-blending step further homogenizes the latex blend composition. Any blending method can be used for the pre-blending including, but not limited to, solvent-based blending, melting block blending, and latex blending. Furthermore, in the case of multilayered articles, the pre-blending of the latex ingredients enhances the chemical adherence between the different rubber layers formed according to the process, and reduces the likelihood of delamination.

[0038] Without being bound by any theory or mechanism, in one embodiment of the invention, the combination of desirable antistatic properties (i.e., surface resistivity and static decay times) and desirable comfort and feel properties of the gloves result from a migration of the non-leachable polymeric antistatic agent to the surface due to the immiscibility of the polymeric antistatic agent with the elastomeric material. It is understood that this combination of desirable antistatic and comfort properties may be achieved by other mechanisms.

EXAMPLES

[0039] The following non-limiting examples illustrate particular embodiments of the invention. The examples are not meant to be comprehensive of the entire scope of the invention.

Example 1

Comparative Static Testing of Gloves

[0040] Three types of glove samples were tested for static resistance properties and compared. The gloves were composed of:
1) 100% natural rubber; 
2) 100% nitrile rubber; and
3) two layers, the outermost layer comprising 80% nitrile rubber and 20% natural rubber, laminated directly to an innermost layer comprising 80% natural rubber and 20% nitrile rubber prepared using the process described below.

For the two-layered glove, one glove sample was tested for static resistance properties. For 100% nitrile rubber gloves, eight different commercially available gloves and six different lab dipped gloves were each tested for static resistance properties (see Table 1). For 100% natural rubber gloves, different gloves were tested for static resistance properties. Each glove sample was tested for surface resistivity, volume resistivity and static decay time (SDT) as set forth above. For each glove sample, three specimens (prepared from three pieces of gloves) were tested and the results averaged. The surface resistivity and volume resistivity of each specimen was measured once. The SDT for each specimen was measured a total of six times. The SDT for each specimen was calculated averaging the STD observed upon charging the specimen to +5000V three times, and to -5000V three times. As relative humidity affects the static resistance properties in an inversely proportional manner, the glove specimens were conditioned in a chamber at relative humidity of 12±3% and a temperature of 22±2°C, prior to taking and recording the measurements. The resistivity and SDT measurements were taken using the outer surface of the glove specimen.

A description of the 100% nitrile rubber gloves studied, and the static resistance properties of each, are detailed in Table 1.

TABLE 1

<table>
<thead>
<tr>
<th>Sample</th>
<th>Manufacturer</th>
<th>Catalog</th>
<th>Surface Resistance, ohms/sq cm</th>
<th>Volume Resistance, ohms</th>
<th>Static Decay Time, s</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder free Nitrile</td>
<td>Omiglace for Allegiance</td>
<td>2Y1812/2N88001-041</td>
<td>6.12 x 10^{12}</td>
<td>7.38 x 10^{11}</td>
<td>4.28</td>
<td>—</td>
</tr>
<tr>
<td>CR10 Nitrile</td>
<td>Smart Glove for Allegiance</td>
<td>2Y1840T</td>
<td>2.24 x 10^{13}</td>
<td>1.63 x 10^{13}</td>
<td>16.13</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>CR10 Nitrile</td>
<td>Smart Glove for Allegiance</td>
<td>2Y1841T</td>
<td>1.65 x 10^{13}</td>
<td>9.10 x 10^{12}</td>
<td>15.35</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>CR10 Nitrile</td>
<td>Smart Glove for Allegiance</td>
<td>2Y1842T</td>
<td>1.44 x 10^{13}</td>
<td>8.26 x 10^{12}</td>
<td>13.78</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>CR10 Nitrile</td>
<td>Smart Glove for Allegiance</td>
<td>2Y1842T</td>
<td>1.93 x 10^{13}</td>
<td>2.59 x 10^{12}</td>
<td>24.5</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>CR10 Nitrile</td>
<td>Allogeance for Allegiance</td>
<td>2Y1841</td>
<td>1.80 x 10^{13}</td>
<td>8.29 x 10^{12}</td>
<td>8.71</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>Powder free Nitrile</td>
<td>Ansell Edmont</td>
<td>Nitrile 93-112</td>
<td>1.42 x 10^{14}</td>
<td>1.77 x 10^{12}</td>
<td>36.65</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #1</td>
<td>Ansell Edmont</td>
<td>Nitrile 93-112L</td>
<td>not measured</td>
<td>not measured</td>
<td>27.51</td>
<td>Clean Room Gloves</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #2</td>
<td>N/A</td>
<td>N/A</td>
<td>4.17 x 10^{13}</td>
<td>5.06 x 10^{12}</td>
<td>7.62</td>
<td>Nitrile Latex: (ca. 30% acrylate/nitrile/ca. 3% butadiene/ca. 3% carboxylic acid)</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #3</td>
<td>N/A</td>
<td>N/A</td>
<td>1.79 x 10^{13}</td>
<td>5.31 x 10^{12}</td>
<td>8.57</td>
<td>Nitrile Latex: (30% acrylate/nitrile/58% butadiene/ca. 3% carboxylic acid)</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #4</td>
<td>N/A</td>
<td>N/A</td>
<td>4.32 x 10^{13}</td>
<td>4.49 x 10^{12}</td>
<td>9.93</td>
<td>Reichhold Tylac 68073-06 (ca. 26% acrylate/nitrile)</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #5</td>
<td>N/A</td>
<td>N/A</td>
<td>7.78 x 10^{13}</td>
<td>6.56 x 10^{12}</td>
<td>15.12</td>
<td>Nitrile Latex: (30% acrylate/nitrile/55% butadiene/5% carboxylic acid)</td>
</tr>
<tr>
<td>Lab dipped Powder free Nitrile #6</td>
<td>N/A</td>
<td>N/A</td>
<td>6.65 x 10^{12}</td>
<td>6.88 x 10^{12}</td>
<td>17.64</td>
<td>Reichhold Nocon 68083-03</td>
</tr>
</tbody>
</table>
The static resistance properties of the 100% natural rubber glove(s), the 100% nitrile rubber gloves, and the multilayered glove, are detailed in Table 2. The range of values for the 100% nitrile rubber gloves from Table 2 are summarized in Table 2. The resistivity values of the 100% natural rubber glove(s) are always higher than the maximum range of the measuring equipment, which is greater than $10^{13}$ Ω/sq and $10^9$ Ω [See TIIUS ACCURATE?].

<table>
<thead>
<tr>
<th>Glove Sample Composition</th>
<th>Surface Resistivity (Ω/sq)</th>
<th>Volume Resistivity (Ω)</th>
<th>Static Decay Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Natural Rubber</td>
<td>$&gt;10^{14}$</td>
<td>$&gt;10^{14}$</td>
<td>$&gt;5,600$</td>
</tr>
<tr>
<td>100% Nitrile Rubber</td>
<td>6.1 x $10^{13}$ to 7.4 x $10^{13}$</td>
<td>4.3 x $10^{12}$ to 4.3 x $10^{12}$</td>
<td>3.7 x $10^{11}$ to 4.3 x $10^{11}$</td>
</tr>
<tr>
<td>Outer Layer 80%/20%</td>
<td>1.4 x $10^{13}$</td>
<td>1.6 x $10^{13}$</td>
<td>2.7 x $10^{13}$</td>
</tr>
<tr>
<td>Inner 80%/20% Natural Rubber/Nitrile Rubber</td>
<td>1.7 x $10^{13}$</td>
<td>2.3 x $10^{13}$</td>
<td>2.7 x $10^{13}$</td>
</tr>
</tbody>
</table>

As can be seen from the data in Table 2, the gloves of the present invention exhibit antistatic properties comparable to those of the 100% nitrile rubber gloves. This result is surprising because, as set forth below, the calculated theoretical values for SDT and surface resistivity for a layer composition of 80% nitrile rubber and 20% natural rubber are not these values.

100% pure nitrile rubber gloves exhibit a SDT of 4 to 37 seconds with 4 seconds as the best case scenario. A glove material containing 80% nitrile rubber would therefore be expected to have an SDT of 3.2 seconds. 100% natural rubber gloves exhibit a SDT of greater than 3,600 seconds with 3,600 seconds as the best case scenario. A glove material containing 20% natural rubber would therefore be expected to have SDT of 720 seconds. Based on these calculations, the expected SDT value for 80% nitrile rubber and 20% natural rubber would be 3.2 seconds ± 270 seconds, or 720 seconds. Instead, the actual demonstrated SDT for this rubber layer was 27.2 seconds—significantly lower than expected.

The surface resistivity theoretical calculations differ from the actual measured values as well. 100% nitrile rubber gloves exhibited surface resistivity values ranging from 6.1x $10^{12}$ to 1.4x $10^{14}$ Ω/sq. Assuming a best case of 6.1x $10^{12}$ Ω/sq, an 80% nitrile rubber surface layer composition would be expected to contribute 4.88x $10^{12}$ Ω/sq. 100% natural rubber exhibited a surface resistivity value of greater than $10^{14}$ Ω/sq. Assuming a best case scenario, a 20% natural rubber surface layer would be expected to contribute more than 2x $10^{13}$ Ω/sq. The calculated surface resistivity for a surface layer on a glove composed of 80% nitrile rubber and 20% natural rubber would be greater than 4.88x $10^{12}$ + 2x $10^{13}$ Ω/sq, or 2.488x $10^{13}$ Ω/sq. However, the actual received surface resistivity value was 1.7x $10^{13}$ Ω/sq — lower than the expected best case value.

Examples 2-6

Detailed Preparation of Gloves

The method 100 used in preparing examples 2-7, comprises:

1. preparing a latex composition composed of a majority of nitrile rubber for a first layer and a latex composition composed of a majority of natural rubber for a second layer,
Both the first and second latex compositions were matured at ambient temperature for about 24 hours, prior to dipping a latex article former and forming a multilayered latex article (e.g., gloves).

Five different gloves were prepared using combinations of a first dip composition and a second dip composition with different ratios of natural rubber and nitrile rubber latex blends (Examples 2-6). The compositions of Examples 2-6 are summarized in Table 4.

A two-layer powder-free antistatic glove with an outermost majority nitrile rubber layer and an innermost majority natural rubber layer was prepared as illustrated in FIG. 1. This process involved making the gloves by a double dip coagulant dipping process followed by chlorinating and washing the gloves as set forth below.

Dipping Procedure

A round ambidextrous glove former was washed thoroughly with detergent and water. The cleaned former was heated in an oven at 70°C. until the former reached a temperature between 59-66°C. The heated former was dipped into a coagulant composition (Table 5), which was maintained at a temperature between 53-59°C. The coagulated coated former was dried in the oven at 70°C. for 3-5 minutes, until the former reached a temperature between 53-58°C. The coagulated coated former was dipped into the first latex composition for a dwell time of about 12-18 seconds. The dwell time in the first latex composition may be varied depending on the desired thickness of the first layer. Subsequently, the former was dried in the oven at 135°C. for 1 minute. The former was then dipped into the second latex composition for a dwell time of about 5-10 seconds. Similar to forming the first layer, the dwell time in the second latex composition may be varied depending on the desired thickness of the second layer. The former covered with a wet gelled latex film was dried in the oven at 70°C. for 2 minutes and then leached with hot tap water at 40°C. for 3 minutes. The leached latex film was manually beaded. The beaded latex film was dried and cured in the oven at 135°C. for 20 minutes. After curing the latex film in the oven, the former was cooled to ambient temperature. The formed glove was then removed from the former. Starch powder may be added to aid the removal of the glove from the former.

Chlorination Procedure

The formed gloves were chlorinated under class 10 clean room environments to remove the powder (i.e., calcium carbonate and starch), thus producing powder-free clean room gloves, and to improve the donning characteristics of the gloves. First, the gloves were manually inverted so that the majority natural rubber layer (i.e., the donning side of the gloves) was on the exterior and exposed. The inverted gloves were loaded into a chlorinator and pre-rinsed with tap water for 15 minutes. The pre-rinsed gloves were then placed in a chlorine solution having a concentration of about 300 ppm for 35 minutes. The chlorinated gloves were rinsed with water for 15 minutes and rinsed again with water five (5) more times. The gloves were then manually inverted so that the majority nitrile rubber layer was on the exterior.

The gloves were then chlorinated a second time using a similar process having the same pre-rinse, chlorinating and post-rinse steps as described above. After the second chlorination, the gloves were placed in a washer. First, the gloves were washed with water at ambient temperature for 15 minutes. Next, the gloves were washed using hot water at 80°C. for 1 hour. Then, the gloves were rinsed with water at ambient temperature for 15 minutes. The gloves were removed from the washer and dried in a tumbler dryer at 80°C. for 2.5 hours and cooled in the tumble dryer at ambient temperature for 30 minutes.

The gloves were then placed in a tumbler washer and washed for six (6) cycles at 40 minutes per cycle using de-ionized water. Water remaining in the gloves was extracted by centrifugal force, i.e., spinning the gloves in a water extraction machine for 15 minutes. Finally, the gloves were dried again in a tumbler dryer at 80°C. for 2.5 hours and cooled in the tumbler dryer at ambient temperature for 30 minutes. The extensive washing protocol described above resulted in clean room gloves having a particle count of less than 6000 particles per square cm for clean room environments.
particles greater than 0.5 μm. It should be noted cleaner gloves tend to exhibit higher surface resistivity values and higher static decay times.

Example 2

A multilayer nitrile/natural rubber latex laminate glove with an outer layer comprising 100% nitrile rubber latex and an inner layer comprising 100% natural rubber latex was prepared in a manner similar to the procedures described above. The first latex composition comprised 100% nitrile rubber latex (and 0% natural rubber latex) and the second latex composition comprised 100% natural rubber latex (and 0% nitrile rubber latex). This particular glove showed delamination of the two layers immediately after heat curing in the oven.

Example 3

A powder-free nitrile/natural rubber latex laminate glove comprising an outer layer having a composition of 95% nitrile rubber latex/5% natural rubber latex and an inner layer comprising a composition of 95% natural rubber latex/5% nitrile rubber latex was prepared in a manner similar to the procedures described above. The glove of Example 3 did not show any delamination of the two layers immediately after heat curing in the oven. However, some delamination of the two layers occurred after the glove was chlorinated. The glove of Example 3 exhibited a surface resistivity of $3.3 \times 10^{12} \, \Omega/\text{sq}$ and a static decay time of 22 seconds (Table 6), and thus possessed antistatic properties. In addition, the glove demonstrated a modulus at 500% elongation of 3.6 MPa and an ultimate elongation of 609% (Table 6).

Example 4

A powder-free nitrile/natural rubber latex laminate glove comprising an outer layer having a composition of 80% nitrile rubber latex/20% natural rubber latex and an inner layer having a composition of 80% natural rubber latex/20% nitrile rubber latex was prepared in a manner similar to the procedures described above. The glove of Example 4 did not show any delamination of the two layers immediately after heat curing in the oven or after chlorination. The glove of Example 4 exhibited a surface resistivity of $1.7 \times 10^{13} \, \Omega/\text{sq}$ and a static decay time of 27.2 seconds (Table 6), and thus possessed antistatic properties. In addition, the glove demonstrated a modulus at 500% elongation of 3.7 MPa and an ultimate elongation of 569% (Table 6).

Example 5

A powder-free nitrile/natural rubber latex laminate glove comprising an outer layer having a composition of 60% nitrile rubber latex/40% natural rubber latex and an inner layer having a composition of 60% natural rubber latex/40% nitrile rubber latex was prepared in a manner similar to the procedures described above. The glove of Example 5 did not show any delamination of the two layers immediately after heat curing in the oven or after chlorination. The glove of Example 5 exhibited a surface resistivity of $2.8 \times 10^{15} \, \Omega/\text{sq}$ and a static decay time of 29.2 seconds (Table 6), and thus possessed antistatic properties. In addition, the glove demonstrated a modulus at 500% elongation of 4.2 MPa and an ultimate elongation of 569% (Table 6).

Example 6

A powder-free nitrile/natural rubber latex laminate glove comprising an outer layer having a composition of 51% nitrile rubber latex/49% natural rubber latex and an inner layer having a composition of 51% natural rubber/49% nitrile rubber latex was prepared in a manner similar to the procedures described above. The glove of Example 6 did not show any delamination of the two layers immediately after heat curing in the oven or after chlorination. The glove of Example 6 exhibited a surface resistivity of $3.0 \times 10^{15} \, \Omega/\text{sq}$ and a static decay time of 34.0 seconds (Table 6), and thus possessed antistatic properties. In addition, the glove demonstrated a modulus at 500% elongation of 6.6 MPa and an ultimate elongation of 569% (Table 6).

### Table 6

<table>
<thead>
<tr>
<th>Glove Sample Composition</th>
<th>Example</th>
<th>Surface Resistivity (Ω/sq)</th>
<th>Volume Resistivity (Ω)</th>
<th>Static Decay Time (sec)</th>
<th>Ultimate Elongation (%)</th>
<th>Modulus at 500% Elongation (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Layer, 95% Nitrile Rubber/5% Natural Rubber Inner Layer</td>
<td>3</td>
<td>$3.3 \times 10^{12}$</td>
<td>$1.47 \times 10^{14}$</td>
<td>21.8</td>
<td>609</td>
<td>3.6</td>
</tr>
<tr>
<td>Outer Layer, 80% Nitrile Rubber/20% Natural Rubber Inner Layer</td>
<td>4</td>
<td>$1.7 \times 10^{13}$</td>
<td>$2.3 \times 10^{13}$</td>
<td>27.2</td>
<td>569</td>
<td>3.7</td>
</tr>
<tr>
<td>Outer Layer, 60% Nitrile Rubber/40% Natural Rubber Inner Layer</td>
<td>5</td>
<td>$2.8 \times 10^{13}$</td>
<td>$3.9 \times 10^{13}$</td>
<td>29.2</td>
<td>569</td>
<td>4.2</td>
</tr>
</tbody>
</table>
TABLE 6-continued

<table>
<thead>
<tr>
<th>Glove Sample Composition</th>
<th>Example</th>
<th>Surface Resistivity (Ω sq)</th>
<th>Volume Resistivity (Ω)</th>
<th>Static Decay Time (sec)</th>
<th>Ultimate Elongation (%)</th>
<th>Modulus at 500% Elongation (MPa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% Nitrile Rubber/60% Natural Rubber Outer Layer</td>
<td>6</td>
<td>$3 \times 10^{13}$</td>
<td>$2.5 \times 10^{12}$</td>
<td>34.0</td>
<td>549</td>
<td>6.6</td>
</tr>
<tr>
<td>51% Nitrile Rubber/49% Natural Rubber Inner Layer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49% Nitrile Rubber/51% Natural Rubber</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[0071] The invention has been described herein above with reference to various and specific embodiments and techniques. It will be understood that reasonable variations in said embodiments and techniques may be made without significantly departing from either the spirit or scope of the invention defined by the following claims.

What is claimed is:

1. An antistatic elastomeric article comprising a non-leachable polymeric antistatic agent and an elastomeric material.

2. The elastomeric article of claim 1 wherein the non-leachable polymeric antistatic agent is selected from the group consisting of nitrile rubber, polyurethane, polyvinyl chloride, epichlorohydrin rubber, EPDM-polyaniline copolymer, polyether, polyalkylene oxide, polyalkylene glycol, polybutadiene, polyacrylate, polyurethane, polyetheresteramide block copolymer, polychloroprene, polyurethane, polyvinyl carbazole, polyglycol diglycidyl ether, polypyrrole, polypyrrole, polyaniline, polypyrrole, polyaniline sulfide, salts of polyacrylic acid, polymer electrolyte/ionomers, quaternary polarsalts, and ammonium polyphosphate.

3. The elastomeric article of claim 1 wherein the elastomeric material is selected from the group consisting of natural rubber, polyurethane, polyaliphene, polychloroprene, plasticized polyvinyl chloride, polybutadiene, butyl rubber, EPDM, polyacrylate rubber, polyurethane, halogenated butyl rubber, and styrene-containing block copolymers.

4. The elastomeric article of claim 1 wherein the non-leachable polymeric antistatic agent is nitrile rubber and the elastomeric material is natural rubber.

5. The elastomeric article of claim 1 comprising about 51% and about 95% non-leachable polymeric antistatic agent and between about 5% and about 49% elastomeric material.

6. The elastomeric article of claim 1 comprising between about 60% and about 90% non-leachable polymeric antistatic agent and between about 10% and about 40% elastomeric material.

7. The elastomeric article of claim 1 comprising between about 65% and about 85% non-leachable polymeric antistatic agent and between about 15% and about 35% elastomeric material.

8. The elastomeric article of claim 1 comprising about 80% non-leachable polymeric antistatic agent and about 20% elastomeric material.

9. The elastomeric article of claim 1 wherein the article is a glove.

10. The elastomeric article of claim 1 wherein the article is a finger cot.

11. The elastomeric article of claim 1 comprising about 80% non-leachable polymeric antistatic agent and about 20% elastomeric material wherein the non-leachable polymeric antistatic agent is nitrile rubber and the elastomeric material is natural rubber.

12. An antistatic multilayered elastomeric article comprising:

a) a first layer comprising a blend of a majority of a non-leachable polymeric antistatic agent and a minority of an elastomeric material, and

b) a second layer comprising a blend of a majority of an elastomeric material and a minority of a non-leachable polymeric antistatic agent.

13. The elastomeric article of claim 12 wherein the layers do not delaminate upon stretching.

14. The elastomeric article of claim 12 wherein the non-leachable polymeric antistatic agent is selected from the group consisting of nitrile rubber, polyurethane rubber, polyvinyl chloride, epichlorohydrin rubber, EPDM-polyaniline copolymer, polyether, polyalkylene oxide, polyalkylene glycol, polybutadiene, polyacrylate, polyurethane, polyetheresteramide block copolymer, polychloroprene, polyurethane, polyvinyl carbazole, polyglycol diglycidyl ether, polypyrrole, polypyrrole, polyaniline, polypyrrole, polyaniline sulfide, salts of polyacrylic acid, polymer electrolyte/ionomers, quaternary polarsalts, and ammonium polyphosphate.

15. The elastomeric article of claim 12 wherein the elastomeric material is selected from the group consisting of natural rubber, polyurethane, polyaliphene, polychloroprene, plasticized polyvinyl chloride, polybutadiene, butyl rubber, EPDM, polyacrylate rubber, polyurethane, halogenated butyl rubber, and styrene-containing block copolymers.

16. The elastomeric article of claim 12 wherein the non-leachable polymeric antistatic agent is nitrile rubber and the elastomeric material is natural rubber.

17. The elastomeric article of claim 12 wherein the article is a glove.

18. The elastomeric article of claim 12 wherein the article is a finger cot.

19. The elastomeric article of claim 12 wherein the article has a surface static resistivity of less than about $10^{12}$ Ω/sq and a static decay time of less than about 60 seconds.
20. The elastomeric article of claim 12, wherein the article has an elastic modulus at 500% elongation of less than about 10 MPa.

21. The elastomeric article of claim 12, wherein the article has an elastic modulus at 500% elongation of less than about 7 MPa.

22. The elastomeric article of claim 12, wherein the article is chlorinated.

23. The elastomeric article of claim 12, further comprising at least one dispersion selected from the group consisting of a sulfur dispersion, a sulfur donor dispersion, a vulcanization accelerator dispersion, a zinc oxide dispersion, an antioxidant dispersion and a titanium dioxide dispersion.

24. The elastomeric article of claim 1, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

25. The elastomeric article of claim 1, wherein the article has an elastic modulus at 500% elongation of less than about 10 MPa.

26. The elastomeric article of claim 1, wherein the article has an elastic modulus at 500% elongation of less than about 7 MPa.

27. The elastomeric article of claim 1, wherein the article is chlorinated.

28. The elastomeric article of claim 11, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

29. The elastomeric article of claim 11 wherein the article has an elastic modulus at 500% elongation of less than about 7 MPa.

30. The elastomeric article of claim 1 further comprising at least one dispersion selected from the group consisting of a sulfur dispersion, a sulfur donor dispersion, a vulcanization accelerator dispersion, a zinc oxide dispersion, an antioxidant dispersion and a titanium dioxide dispersion.

31. The elastomeric article of claim 12, wherein the first layer is an outer layer of the article.

32. The elastomeric article of claim 13, wherein the outer layer comprises about 80% non-leachable polymeric antistatic agent and about 20% elastomeric material.

33. The elastomeric article of claim 12, wherein the second layer is an inner layer of the article.

34. The elastomeric article of claim 32, wherein the inner layer comprises about 50% elastomeric material and about 20% non-leachable polymeric antistatic agent.

35. The elastomeric article of claim 34, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

36. The elastomeric article of claim 35, wherein the article has an elastic modulus at 500% elongation of less than about 7 MPa.

37. The elastomeric article of claim 31, wherein the outer layer comprises between about 51% and about 95% non-leachable polymeric antistatic agent and between about 5% and about 49% elastomeric material.

38. The elastomeric article of claim 37, wherein the inner layer comprises between about 51% and about 95% elastomeric material and between about 5% and about 49% non-leachable polymeric antistatic agent.

39. The elastomeric article of claim 38, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

40. The elastomeric article of claim 31, wherein the outer layer comprises between about 60% and about 90% non-leachable polymeric antistatic agent and between about 10% and about 40% elastomeric material.

41. The elastomeric article of claim 40, wherein the inner layer comprises between about 60% and about 90% elastomeric material and between about 10% and about 40% non-leachable polymeric antistatic agent.

42. The elastomeric article of claim 41, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

43. The elastomeric article of claim 31, wherein the outer layer comprises between about 65% and about 85% non-leachable polymeric antistatic agent and between about 15% and about 35% elastomeric material.

44. The elastomeric article of claim 43, wherein the inner layer comprises between about 65% and about 85% elastomeric material and between about 15% and about 35% non-leachable polymeric antistatic agent.

45. The elastomeric article of claim 44, wherein the article has a surface resistivity of less than about $10^{14} \, \Omega$/sq and a static decay time of less than about 60 seconds.

46. A process for making an antistatic multilayered elastomeric article having a first layer and a second layer comprising:

a) preparing a first latex composition by mixing natural rubber latex with nitrile rubber latex, wherein the natural rubber latex in said first latex composition is in a lesser amount than the nitrile rubber latex in said first latex composition,

b) preparing a second latex composition by mixing nitrile rubber latex with natural rubber latex, wherein the nitrile rubber latex in said second latex composition is in a lesser amount than the natural rubber latex in said second latex composition, and
c) forming the first layer from said first latex composition and the second layer from said second latex composition.

47. The process of claim 46, wherein step a) further comprises mechanically mixing the natural rubber latex with the nitrile rubber latex, wherein step b) further comprises mechanically mixing the nitrile rubber latex with the natural rubber latex.

48. The process of claim 47, wherein step a) further comprises adjusting the first latex composition to a pH of about 9.5.

49. The process of claim 47, wherein step c) further comprises forming a first latex gel from the first latex composition and a second latex gel from the second latex composition.

50. The process of claim 46, wherein step c) further comprises dipping a latex article former into a crosslinker solution, dipping the former a second time into the first latex composition, and dipping the former a third time into the second latex composition.

51. The process of claim 46, wherein step c) further comprises vulcanizating the article.

52. The process of claim 46, further comprising a step d) chlorinating the article.

53. The process of claim 52, wherein the chlorinating step further comprises:

inverting the article a first time,
exposing the article to a chlorine solution a first time
inverting the article a second time, and
exposing the article to a chlorine solution a second time.
54. An antistatic multilayer elastomeric article comprising:
a) a first layer comprising a synthetic rubber latex and a
nitrile rubber latex, the synthetic rubber latex is in a
lesser amount than the nitrile rubber latex, and
b) a second layer comprising a nitrile rubber latex and a
synthetic rubber latex, the nitrile rubber latex is in a
lesser amount than the synthetic latex.

55. The article of claim 54 wherein the layers do not
delaminate upon stretching.

56. A process for making an antistatic multilayer elasto-
meric article having a first layer and a second layer comprising:
a) preparing a first latex composition by mixing synthetic
rubber latex with nitrile rubber latex, wherein the syn-
thetic rubber latex in said first latex composition is in a
lesser amount than the nitrile rubber latex in said first
latex composition,
b) preparing a second latex composition by mixing nitrile
rubber latex with synthetic rubber latex, wherein the
nitrile rubber latex in said second latex composition is in
a lesser amount than the synthetic rubber latex in said
second latex composition, and
c) forming the first layer from the first latex composition
and the second layer from the second latex composition.

* * * * *