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(54) **ABRASIVE ARTICLE AND A PROCESS FOR PREPARATION THEREOF**

(71) Applicant: **3M INNOVATIVE PROPERTIES COMPANY**, St. Paul, MN (US)

(72) Inventors: **Deval Y. Vashistha**, Tamil Nadu (IN); **Raju B.S. Thakur**, Karnataka (IN); **Samir H. Soni**, Ahmedabad (IN); **Dhritisunder Bhattacharya**, Karnataka (IN); **Satish V. Palled**, Karnataka (IN)

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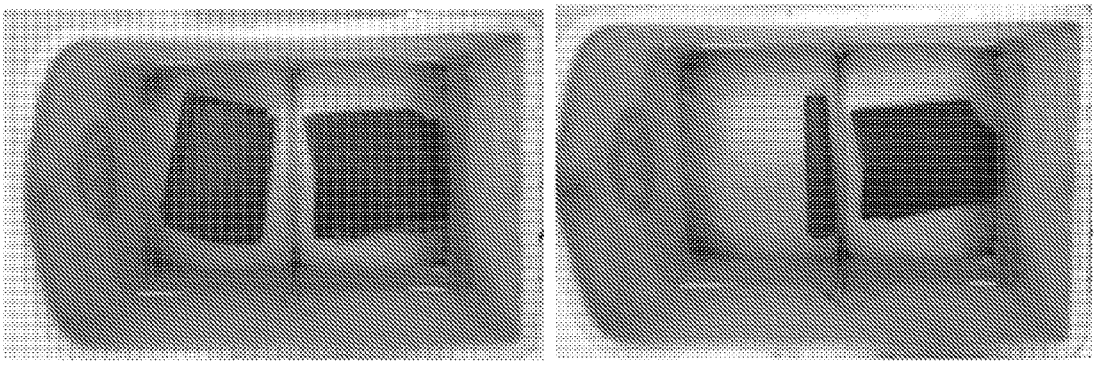
(57) **ABSTRACT**

The present invention relates to abrasive articles, more specifically to coated abrasive article with non-woven backing and a method of their preparation.



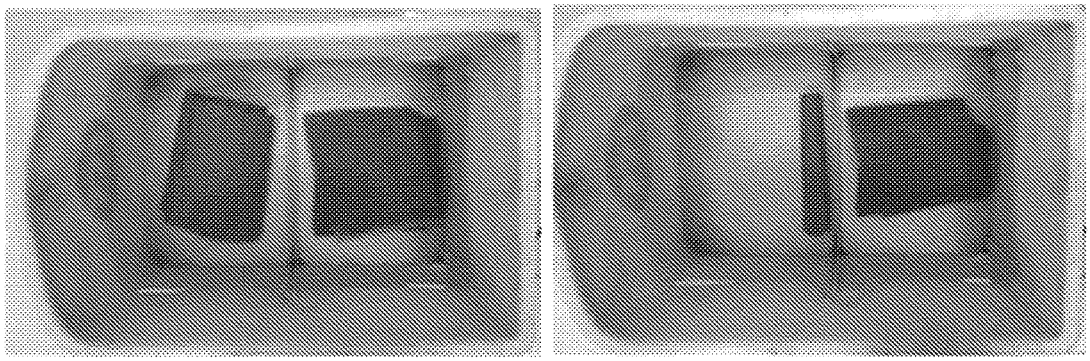


Fig. 1

ABRASIVE ARTICLE AND A PROCESS FOR PREPARATION THEREOF

TECHNICAL FIELD

[0001] The present invention relates to abrasive articles, more specifically to coated abrasive articles with non-woven backing and a process for their preparation.

BACKGROUND

[0002] Abrasive articles, such as coated abrasives and bonded abrasives, are used in various industries to machine work pieces, such as by lapping, grinding or polishing. Machines utilizing abrasive articles, span a wide industrial scope from optics industries, automotive paint repair industries to metal fabrication industries. In each of these examples, manufacturing facilities use abrasives to remove bulk material or affect surface characteristics of products.

[0003] Coated abrasives are used in a wide variety of applications. Most applications require hand sanding where a user will grasp a coated abrasive article in hand and apply it to the surface being treated. Coated abrasives are generally composed of a backing, abrasive grains and an adhesive to bond the grains to the backing. Coated abrasives tools are available in different forms such as discs, rolls, belts and spiral points, for use in both hand/machine polishing and finishing applications. Coated abrasives are employed in sanding, finishing and polishing operations under extreme conditions of heat and humidity.

[0004] Generally materials such as paper, treated paper, polymers, fibers, non-woven materials and cloths are used as backing materials for coated abrasive articles. Backing material of hand sanding coated abrasive articles is primarily made of paper, cloth, fiber, film or non-woven material. For wet sanding applications, backing material generally consists of latex-treated paper. Performance of a coated abrasive article can be indicated by the amount of material being removed from the abrasive article and the degree of smoothness in finished surface. A coated abrasive article can be designed to provide a desired level of removal of material from a surface being abraded to obtain a particular surface finish. Additionally an abrasive article should be flexible and durable over a long duration which is a function of backing layer and abrasive grains deposited over backing layer.

[0005] Conventional coated abrasives having paper backing tends to curl under storage conditions and during operation in dry applications. For paper backings treated with water repellents, the curl behavior is dependent on humidity conditions. In dry operations, heat build-up in coated abrasives escalates due to frictional heating, which may separate the abrasive particles from backing. For applications under wet conditions, backing is generally made from latex treated paper. Such backings tend to expand and curl due to high humidity in operating and storage conditions leading to considerable loss of their ability to abrade, reduction in aggressive cut and reduction of life expectancy.

[0006] U.S. Pat. No. 3,014,795 (Schmidlin et. al) reports Mylar polyester film as backing material for coated abrasive articles for use in wet sanding operations.

[0007] U.S. Pat. No. 5,582,625 (Wright et. al) reports a curl resistant coated abrasive backing comprising a continuous solid resin matrix having dispersed therein an essentially isotropic fibrous web.

[0008] U.S. Pat. No. 6,432,549 (Kronzer et. al) recites a curl resistant, antislip abrasive backing which includes a latex-reinforced paper having a first surface and a second surface.

[0009] EP Pat No. 0617652 reports a backing for abrasive articles comprising a tough, heat resistant, thermoplastic binder material, and an effective amount of a fibrous reinforcing material. The durability of coated abrasive articles is also influenced by method of preparation of abrasive slurry and its deposition over the backing.

[0010] U.S. Pat. No. 8,652,225 (Mackay et. al.) reports flexible abrasive finishing article which has a tailored cutting ability, a long useful life which can be made in a simple method and does not in any way compromise the flexibility of the abrasive finishing article.

[0011] Generally a layer of abrasive particles is deposited over backing in a random pattern and cured to obtain an abrasive article. Patterned abrasive articles having abrasive particles being deposited in a predetermined shape can perform better over abrasive articles with randomly deposited abrasive particles. By orienting the deposition of abrasive particles over the backing, it is possible to obtain a coated abrasive with desirable pattern, thereby increasing performance of abrasive article.

[0012] GB patent Application No. 2,094,824 (Moore et. al) pertains to a patterned lapping film. The abrasive/binder resin slurry is prepared and the slurry is applied through a mask to form discrete islands. Next, the binder resin is cured. The mask may be a silk screen, stencil, wire or a mesh.

[0013] US patent application No. 20140308884 (Jeffrey et al.) reports abrasive article comprises a flexible backing having a major surface comprising a conformable polymer capable of expanding and contracting in transverse directions; a make resin contacting the major surface and extending across the major surface in a pre-determined pattern.

SUMMARY

[0014] In one aspect, there is provided a coated abrasive article comprising a) non-woven backing and b) one or more layers of abrasive slurry deposited over the backing; wherein the material for backing is selected from spun-bonded non-woven fabric materials, impregnated with acrylic emulsion and the abrasive slurry comprise mineral particles and binder.

[0015] Advantageously, there is provided an abrasive article which is flexible, non-warping and is resistant to tear and curl. Some preferred embodiments of the abrasive article maintain a constant aggressive cut while at the same time, can be suitable for hand and machine applications.

[0016] In another aspect a backing comprising a spun-bonded non-woven polypropylene fabric impregnated with acrylic emulsion is provided.

[0017] Advantageously, the backing for abrasive article is obtained in a quick, efficient and cost-effective manner and can be employed in abrasive articles for use in wet and dry conditions.

[0018] In yet another aspect, there is provided a process of preparing a backing comprising (a) providing a non-woven fabric and (b) impregnating the non-woven fabric with an acrylic emulsion.

[0019] In a further aspect, there is provided a method of preparation of coated abrasive article comprising: (a) providing an abrasive slurry comprising mineral particles and

binder (b) depositing the abrasive slurry over a backing as a layer (c) preheating the deposited abrasive slurry and (d) curing the deposited abrasive slurry.

[0020] The foregoing has outlined some of the most pertinent aspects of the invention. These aspects should be construed to be merely illustrative of some of the more prominent features and applications of the intended invention. The invention includes other features and advantages which will be described or will become apparent from the following more detailed description of the embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] The foregoing summary, as well as the following detailed description of the invention will be better understood when read in conjunction with the appended drawings. For the purpose of assisting in the explanation of the invention, there are shown in the drawings embodiments which are presently preferred and considered illustrative. It should be understood, however, that the invention is not limited to the images shown therein. In the drawings:

[0022] FIG. **1** is a photographic image demonstrating curl resistance behavior of spun bonded non-woven polypropylene with acrylic emulsion and latex treated paper.

DETAILED DESCRIPTION

[0023] The present invention will now be described more fully herein after. For the purposes of the following detailed description, it is to be understood that the invention may assume various alternative variations and step sequences, except where expressly specified to the contrary. Thus, before describing the present invention in detail, it is to be understood that this invention is not limited to particularly exemplified systems or embodiments that may, of course, vary. The use of examples anywhere in this specification including examples of any terms discussed herein is illustrative only, and in no way limits the scope and meaning of the invention or of any exemplified term. Likewise, the invention is not limited to various embodiments given in this specification.

[0024] Unless otherwise defined, 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 pertains.

[0025] As used herein, the singular forms "a," "an," and "the" include plural reference unless the context clearly dictates otherwise. The term "and/or" means one or all of the listed elements or a combination of any two or more of the listed elements

[0026] The terms "preferred" and "preferably" refer to embodiments of the invention that may afford certain benefits, under certain circumstances. However, other embodiments may also be preferred, under the same or other circumstances. Furthermore, the recitation of one or more preferred embodiments does not imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the invention.

[0027] When the term "about" is used in describing a value or an endpoint of a range, the disclosure should be understood to include both the specific value and end-point referred to.

[0028] As used herein the terms "comprises", "comprising", "includes", "including", "containing", "characterized by", "having" or any other variation thereof, are intended to cover a non-exclusive inclusion.

[0029] The term "acrylic emulsion" as used herein refers to a water dispersion of polymers or co-polymers of acrylic acid.

[0030] The term "abrasive particles" as used herein refers to a material, often mineral, that can be used to wear away another material through rubbing.

[0031] The term "backing" as used herein refers to a substrate, a component of coated abrasives, to which abrasive grains are being deposited.

[0032] The term "coated abrasive" as used herein refers to a type of abrasives wherein abrasive particles are deposited on a backing for polishing and finishing applications.

[0033] The term "impregnation" as used herein refers to diffusing or imbuing a non-woven fabric using a substance. The term impregnation and saturation is used interchangeably herein.

[0034] The term "non-woven fabric" as used herein refers to a fabric wherein the individual fibers of the fabric are held together by a bonding agent to form a fabric. The non-woven fabrics are neither woven nor knitted.

[0035] The term "thermoplastic" as used herein refers to a type of plastic made from polymer which tends to become pliable or soft when heated and solidifies upon cooling.

[0036] Conventional coated abrasives suffer from the problem of curling of backing during wet sanding and abrading operations and heat build-up during dry sanding operations. These problems can cause early failure and poor functioning of abrasive articles ultimately affecting the life of abrasive articles. Current solutions include treatment of paper backings and use of polyester films. However, such treatments or use of alternate materials do not render the coated abrasive articles suitable for applications under both dry and wet conditions. Therefore, conventionally known articles being inadequate for use in varied and extreme conditions, there is a need for a backing that can render the abrasive article to be effectively used in extreme conditions.

[0037] The present invention is a coated abrasive article comprising a backing and one or more coating layers of abrasive slurry deposited over the backing to solve the problems associated with currently used backings and articles comprising these backings, for example, the problem associated with use of currently used backings in sanding applications. The present invention offers a solution to the problems of curling, heat build-up and tear-resistance in coated abrasive articles, by providing a backing comprising a non-woven fabric impregnated with acrylic emulsion. The coated abrasive article is economically advantageous as it employs inexpensive raw materials which distinctly reduce the costs.

[0038] In an embodiment, the abrasive article comprises (a) a backing and (b) one or more abrasive slurry layers, wherein the abrasive layers are formed by depositing abrasive slurry comprising mineral particles and binder, over the backing. The abrasive article is resistant to curling and piercing during repeated usage.

[0039] The backing is selected from a group consisting of non-woven thermoplastic polymer materials. Appropriate thermoplastic polymers include without limitation, nylon, polypropylene, polyester, polyethylene, polyimides, fluoropolymers, polycarbonates, polyurethanes, and polystyrenes.

[0040] In an embodiment, the non-woven material is spun-bonded polypropylene fabric. Spun-bonded polypropylene fabric is formed by the random distribution of minute continuous polypropylene fibers in web form. This web is self-bonded with no binder being employed to maintain sheet integrity. The texture of the bonded surface is relatively different and compressed compared to other portions. At low costs, spun bond fabrics exhibit good bursting strength and tensile strength compared to woven fabric at similar gramages (gsm).

[0041] The backing is impregnated with an acrylic emulsion. Appropriate emulsions include without limitations SBR latex, Nitrile latex, vinyl latex, acrylated urethanes, acrylated acrylics, acrylated epoxies, aminoplast derivatives having pendant alpha, beta unsaturated carbonyl groups, isocyanurate derivatives having at least one pendant acrylate group, isocyanate derivatives having at least one pendant acrylate group, acrylated polyesters and mixtures and combinations thereof. In one embodiment, the acrylic emulsion is acrylate acrylic.

[0042] In another embodiment, the backing is impregnated with an acrylic emulsion containing at least one filler. The addition of filler to the acrylic emulsion make the backing more impervious and also further reduces the overall cost of the abrasive article. Appropriate fillers include without limitations clay, silica, talc, calcium carbonate or mixtures thereof.

[0043] The backing comprises two surfaces designated a first surface and second surface. The first surface of the backing is applied with one or more layers of abrasive slurry to form a coated abrasive article. The second surface of the backing refers to a surface of the backing where abrasive slurry is not deposited.

[0044] In an embodiment, the backing made of non-woven spun-bonded polypropylene fabric impregnated with acrylic emulsion is deposited with one or more layers of abrasive slurry on both first and second surface of the backing.

[0045] Provided herein is a process for preparing a backing comprising the steps of (a) providing a non-woven spun-bonded polypropylene fabric and (b) impregnating the non-woven spun-bonded polypropylene fabric with an acrylic emulsion.

[0046] The impregnation of the non-woven spun-bonded polypropylene fabric may be performed by dipping, saturation, pressure application and thermal applications.

[0047] In an embodiment, the impregnation of acrylic emulsion onto the non-woven polypropylene fabric is carried out by dipping the non-woven polypropylene fabric into a stream of acrylic emulsion and squeezing out excess emulsion from fabric by passing the fabric between two rollers. The pressure exerted onto the fabric by the rollers is adjusted to obtain an impregnated non-woven polypropylene fabric. The acrylic emulsion impregnated non-woven polypropylene fabric is further subjected to drying performed at a temperature in the range of 110-160° C. for duration of 5-50 minutes. Drying of acrylic emulsion impregnated non-woven polypropylene fabric is subsequently carried out in static or continuous oven.

[0048] In another embodiment, the non-woven fabric is surface treated or primed prior to impregnation with acrylic emulsion. Surface priming improves adhesion of abrasive slurry to the backing and acrylic emulsion impregnation.

[0049] In another embodiment, the backing is surface treated with adhesion promoters having chlorinated polyolefin. Surface treatment of backing is carried out by spraying adhesion promoter uniformly over the surface of backing. The thickness of polyolefin adhesion promoter coating over the backing is in the range of 10 microns to 20 microns.

[0050] The treatment of the backing with acrylic emulsion advantageously provides easy tear-ability of the abrasive article. The backing treatment further renders the abrasive article malleable for forming three dimensional shapes desired for machine and hand sanding operations. The backing treatment also advantageously provides anti-curling properties to the abrasive article for use under wet conditions. Expediently, the backing treatment provides anti-piercing properties to abrasive article during repeated usage thereby contributing to a longer span of the abrasive article. The impregnations of backing using acrylic emulsion reduce the porosity of backing thereby enhancing the tear strength of the abrasive article during use. Additionally the impregnation further renders the abrasive article to be converted to appropriate size. The impregnation also provides a surface suitable for further depositing more layers abrasive slurry. Reduced porosity also prevents the abrasive slurry from seeping through the backing. The abrasive article comprising the non-woven spun bonded polypropylene fabric impregnated with acrylic emulsion as backing material advantageously provides a slow decay in cut-rate of the article resulting in consistent finish & durability (life of usage).

[0051] The backing comprising non-woven fabric impregnated with an acrylic emulsion is flexible, non-warping or non-curling and can be effectively held during hand sanding operations while maintaining its aggressive cutting value.

[0052] In an embodiment, there is provided a coated abrasive article comprising the backing made of non-woven polypropylene fabric impregnated with acrylic emulsion and one or more abrasive coating layers over the backing, wherein the abrasive coating layer is formed by depositing abrasive slurry, wherein the abrasive slurry comprises of one or more mineral particles and binder.

[0053] The binder in the abrasive slurry serves the purpose of securing said abrasive particles to said first surface of backing. Appropriate abrasive particles include without limitations minerals of chromia, emery, aluminum oxide, zirconia, diamond, ferrous/ferric oxide, silicon carbide, fused aluminum oxide, heat treated aluminum oxide, ceramic aluminum oxide, ceria, cubic boron carbide, garnet and mixtures thereof. Abrasive minerals suitable for coated abrasive articles have an average particle size in a range from 250 microns to 8 microns.

[0054] The number of layers of abrasive slurry over the backing determines the thickness of the coated abrasive article. Abrasive minerals in individual layers of abrasive slurry comprises of homogeneous and/or heterogeneous minerals having abrasive properties. The hardness of minerals employed in abrasive slurry depends on choice of mineral particles. The size and type of mineral particles in the abrasive slurry provides the desired performance of coated abrasive article.

[0055] The binder comprises of at least one resin, at least one curing agent and/or at least one filler. Appropriate resins include without limitations thermal curable phenolics, oil modified alkyds, thermal curable epoxies or UV curable epoxy-acrylate Appropriate curing agents include without limitations thermal curing agents and UV curing agents. Appropriate curing agents include without limitations photo

initiators for UV curable epoxy curing agents such as Duracur 1173 and CPI 6976. Appropriate fillers include without limitations silica, clay, talc, calcium carbonate or mixtures thereof. In an aspect, the binder in abrasive slurry comprises one resin and a curing agent.

[0056] The binder is pre-treated by application of heat to enhance performance. Pre-heating reduces viscosity of resin and enables the resin to flow to the backing, thereby increasing the adhesion of abrasive slurry to the backing and exposing minerals for uniform performance. Pre-heating of binder is performed at a temperature in a range of 50° C. to 150° C. The ratio of binder to mineral in abrasive slurry is tailored depending on size and type of mineral. The ratio of binder to mineral is in a range from 1:10 to 10:1 or from 8:2 to 2:8.

[0057] Appropriate methods of deposition of abrasive slurry layer over the backing includes but not limited to electrostatic coating, drop coating, mechanical projection, spray coating, roll coating, die coating, screen printing, rotogravure printing, knife coating or combinations thereof. Area of coverage of abrasive slurry layer over the backing is in the range of 10% to 100% or from 20% to 80% or from 30% to 60%. Alternatively, the non-coated open spaces are in the range of from 0% to 90%.

[0058] The minerals particles in abrasive slurry layers are distributed in a manner, the mineral particles are coarser in outermost layer of abrasive slurry and gradually decrease to finer particles in layers of abrasive slurry towards backing. Abrasive slurry is deposited randomly or in a desired pattern. The amount of abrasive slurry deposited in individual layers over the backing may vary depending on desired requirements.

[0059] Subsequent to deposition, the abrasive slurry layer is cured. Appropriate curing methods include without limitations thermal curing, UV curing, chemical curing or a combination thereof. The cured and finished product results in a coated abrasive article. The finished abrasive article can be made available in the form of belts, discs, hand pads and the like, for use in sanding applications.

[0060] In an embodiment, the cured abrasive slurry deposited over the backing may further be coated with a stearate formulation comprising of calcium stearate and/or zinc stearate to enhance the performance of coated abrasive article in dry conditions. The stearate formulation applied over the cured abrasive slurry prevents the heat build-up in the abrasive article during dry operations and resist heat accumulation in the abrasive article.

[0061] Provided herein is a process for preparing a coated abrasive article. The process comprises the steps of:

[0062] a) depositing abrasive slurry comprising one or more mineral particles and binder over a backing as a layer;

[0063] b) heating the abrasive slurry deposited over the backing; and

[0064] c) curing the abrasive slurry deposited over the backing;

[0065] optionally

[0066] d) repeating steps (a) to (c) to obtain one or more layers of abrasive slurry over backing;

[0067] e) coating the cured abrasive slurry with a stearate formulation.

[0068] Appropriate materials for backing include non-woven materials. In an embodiment, the backing is a non-woven spun-bonded polypropylene fabric impregnated with acrylic emulsion.

[0069] In another embodiment, the backing is primed or surface treated with polyolefin adhesion promoters prior to the impregnation with acrylic emulsion.

[0070] The mineral particles comprises of minerals selected from a group consisting of chromia, emery, alumina, zirconia, diamond, ferric/ferrous oxide, aluminum oxide, silicon carbide, fused aluminum oxide, heat treated aluminum oxide, ceramic aluminum oxide, ceria, cubic boron carbide, garnet and combinations thereof. Abrasive minerals have an average particle size in a range from 250 microns to 08 microns. The size and type of mineral particles in the abrasive slurry depends on the desired performance of coated abrasive article. The mineral content of the abrasive slurry is in a range from 20% to 80% by weight to the total weight of abrasive slurry.

[0071] The binder in the abrasive slurry comprises of at least one resin, at least one curing agent and at least one filler. The resin may be selected from a group consisting of thermal curable phenolics, oil modified alkyds, thermal curable epoxies or UV-curable epoxy-acrylate. The curing agent may be selected from a group consisting of UV curable agents or thermal curable agents. The filler may be selected from a group consisting of clay, silica, talc, calcium carbonate or mixtures thereof. In an embodiment the binder comprises of at least one resin and at least one curing agent.

[0072] Deposition of abrasive slurry over said first surface of backing as a layer is carried out by methods such as electrostatic coating, drop coating, mechanical projection, spray coating, roll coating, die coating, screen printing, rotogravure printing or knife coating.

[0073] The heating of step (b) is performed at a temperature in a range of 50° C. to 150° C. for duration in a range of 3 minutes-50 minutes. Abrasive slurry deposited overs the backing reduces the viscosity of binder thereby increasing the adhesion of abrasive slurry to the backing and exposing minerals for uniform and enhanced performance. The curing of step (c) is performed by thermal curing, chemical curing, UV curing or a combination thereof.

[0074] The steps (a) to (c) are repeated to obtain a desired number of layers of abrasive slurry over the backing. Abrasive slurry deposited over the backing is cured to form a layer prior to depositing further abrasive slurry for subsequent layers to obtain abrasive article with more than one layer of abrasive slurry. The pattern of deposition of abrasive slurry across the backing provides uniform cut and scratch pattern. The deposition is not limited to any specific pattern and depends on requirement. The minerals particles in abrasive slurry layers are distributed in a manner, such that, the mineral particles are finer in abrasive slurry layer near backing and the mineral particles are coarser in abrasive slurry layers away from the backing.

[0075] In an embodiment, the cured abrasive slurry deposited over the backing is coated with a stearate formulation comprising calcium stearate, zinc stearate or a combination thereof.

[0076] There are a variety of alternative techniques and procedures available to those of skill in the art that would similarly permit one to successfully practice the intended invention. All specific materials and methods described below, in whole or in part, fall within the scope of the

invention. These specific compositions, materials, and methods are not intended to limit the invention, but merely to illustrate specific embodiments falling within the scope of the invention. One skilled in the art may develop equivalent materials, and methods without the exercise of inventive capacity and without departing from the scope of the invention. It will be understood that many variations can be made in the procedures herein described while still remaining within the bounds of the invention. It is the intention of the inventors that such variations are included within the scope of the invention.

Exemplary Embodiments

[0077] Embodiment A is an abrasive article comprising: a) non-woven backing; and b) one or more layers of abrasive slurry deposited over the backing, wherein said non-woven backing is impregnated with an acrylic emulsion and wherein the abrasive slurry comprises of one or more mineral particles and binder.

[0078] Embodiment B is the article of Embodiment A, wherein the non-woven backing is selected from a group consisting of polymer materials.

[0079] Embodiment C is the article of Embodiment B, wherein the polymer material is spun-bonded polypropylene fabric.

[0080] Embodiment D is the article of embodiment A, comprising more than one layer of abrasive slurry deposited over the backing.

[0081] Embodiment E is the article of embodiment D, wherein the mineral particles are coarser in outermost layer of abrasive slurry and gradually decreases to finer particles in layers of abrasive slurry towards backing.

[0082] Embodiment F is the article of embodiment A, D and E, wherein the mineral particles are selected from a group consisting of silicon carbide, aluminium oxides, chromia, alumina zirconia, diamond, iron oxide, ceria, cubic boron nitride, boron carbide, garnet and combinations thereof

[0083] Embodiment G is the article of embodiment A, wherein the binder comprises of a resin, filler and/or a curing agent.

[0084] Embodiment H is the article of embodiment G, wherein the resin is selected from a group consisting of thermal curable phenolics, oil modified alkyds, thermal curable epoxies or UV-curable epoxy-acrylate.

[0085] Embodiment I is the article of embodiment G, wherein the filler is selected from a group consisting of clay, silica, talc, calcium carbonate or mixtures thereof.

[0086] Embodiment J is the article of embodiment G, wherein the curing agent is selected from a group consisting of thermal curing agents, UV curing agents or combinations thereof.

[0087] Embodiment K is a backing for abrasive article comprising non-woven spun-bonded polypropylene fabric impregnated with acrylic emulsion.

[0088] Embodiment L is the backing of embodiment K, wherein the acrylic emulsion is selected from a group consisting of SBR latex, Nitrile latex, vinyl latex, acrylated urethanes, acrylated acrylics, acrylated epoxies, aminoplast derivatives having pendant alpha, beta unsaturated carbonyl groups, isocyanurate derivatives having at least one pendant acrylate group, isocyanate derivatives having at least one pendant acrylate group, acrylated polyesters, and mixtures thereof.

[0089] Embodiment M is the backing of embodiment K, wherein the acrylic emulsion optionally comprises of at least one filler.

[0090] Embodiment N is a process for preparing the backing of embodiment K comprising: a) providing a non-woven spun-bonded polypropylene fabric; b) surface treating or priming the fabric; and c) impregnating the fabric with an acrylic emulsion.

[0091] Embodiment O is a coated abrasive article comprising the backing of embodiment K and one or more layers of abrasive slurry deposited over the backing.

[0092] Embodiment P is the article of any of embodiments above, in the form of a sheet, disc or a roll, resistant to curling and piercing.

[0093] Embodiment Q is a process of preparing an abrasive article comprising the steps of: a) depositing abrasive slurry comprising one or more mineral particles and binder over a backing as a layer; b) heating the abrasive slurry deposited over the backing; and c) curing the abrasive slurry deposited over the backing; optionally d) repeating steps (a) to (c) to obtain one or more layers of abrasive slurry over backing; e) coating the cured abrasive slurry with a stearate formulation.

[0094] Embodiment R is the process of embodiment Q, wherein said backing is selected from a group consisting of non-woven materials.

[0095] Embodiment S is the process of embodiment Q & R, wherein said backing is impregnated with an acrylic emulsion.

[0096] Embodiment T is the process of embodiment Q, wherein said non-woven material is spun-bonded polypropylene fabric.

[0097] Embodiment U is the process of embodiment Q, wherein the backing is primed or surface treated prior to impregnation with acrylic emulsion.

[0098] Embodiment V is the process of embodiment Q, wherein the deposition of abrasive slurry over the backing is carried out by techniques selected from roll coating, spray coating, screen printing, roto gravure printing, knife coating or a combination thereof.

[0099] Embodiment W is the process of embodiment Q, wherein the heating is performed at a temperature in range of 50° C. to 150° C.

[0100] Embodiment X is the process of embodiment Q, wherein the curing is performed by thermal curing or UV curing, or a combination thereof.

[0101] Embodiment Y is the process of embodiment Q, wherein the stearate formulation comprises calcium stearate and/or zinc stearate.

EXAMPLES

[0102] The following examples are set forth to further exemplify the invention and are not intended to be limiting thereof.

Example 1: Preparation of the Backing

[0103] 80 gsm beige non-woven spun-bonded polypropylene fabric available from M/S. Sidwin Fabric, Himmat Nagar, Gujarat, India) was used as the backing. The backing was treated by spraying polyolefin adhesion promoter, 3M Automix™, part no. 05907 available from 3M Company, over the backing. A roll of non-woven spun-bonded polypropylene fabric was primed with polyolefin adhesion pro-

moter by passing the fabric roll-to-roll through a spray chamber. The spray chamber deposits a uniform layer of polyolefin adhesion promoter over the backing. The thickness of layer of polyolefin adhesion promoter deposited over the backing a thickness of 10 microns to 20 microns. Solvent from the primer was allowed to evaporate in the spray chamber before the fabric was re-wound on the second roll. The primer provided helped improving the adhesion of the abrasive slurry to the non-woven fabric.

Impregnation of Acrylic Emulsion into the Backing

[0104] The fabric coated with adhesion promoter was dipped into a stream of an acrylic emulsion Savron 3107 (Magnum polymers, Boisar, Maharastra, India). The acrylic emulsion has a total solid content in the range of 44 to 46%; pH in range of 2-3; viscosity [Brookfield at 25° C.] of 20 cps, Tg of 30-34° C. and saturation weight in the range of 40-60 gsm. Subsequent to dipping the fabric into the emulsion, the excess acrylic emulsion is eliminated from the fabric by passing the fabric dipped in Savron 3107 between two rollers. The excess acrylic emulsion was squeezed from the fabric by the two rollers and an acrylic emulsion impregnated non-woven polypropylene fabric having a dry saturation weight of 40-60 gsm and wet saturation weight of 80-120 gsm was obtained. The viscosity of acrylic emulsion used for impregnating the non-woven spun-bonded polypropylene fabric was 20-80 cps at 25° C. The acrylic emulsion impregnated non-woven polypropylene fabric was further subjected to drying at a temperature of 110-160° C. for duration of 05 minutes −50 minutes. The drying of acrylic emulsion impregnated non-woven polypropylene fabric was carried out in static oven.

Example 2: Preparation of a Coated Abrasive Article

[0105] The non-woven spun-bonded polypropylene fabric impregnated with acrylic emulsion was converted to sheets of desired size was placed under screen printing machine to deposit abrasive slurry. The abrasive slurry prepared comprising a mixture of binder and mineral particles was screen printed on to the surface of fabric using metal mesh of 50 T grade. The slurry coated non-woven polypropylene sheet was placed in thermal oven at temperature 50 to 150° C. for duration in the range of 3 minutes to 50 minutes. These sheets were then exposed to UV light by placing them on conveyor of the UV curing equipment. The UV curing equipment is preset to deliver energy of 1500 to 3000 mj/cm^2. The cured sheets are ready for conversion to required shape and sizes.

Example 3: Assessment of Strength and Resistance Parameters

[0106] The backing as obtained by the Example 1 was tested to analyze its ability to withstand severe conditions during sanding and finishing operations. The test methods measure the mechanical properties of the backing are described herein. A 100 gsm and 135 gsm latex treated paper suitable for dry and wet operations obtained from 3M Company, was used as reference.

Determination of Tensile Strength

[0107] Dry conditioning of the backing was carried out subsequent to stabilization in climate control & humidity (CTH) laboratory for 24 hours. Tests for measuring tensile strength of the backing were carried, after soaking the backing in water for duration of 60 minutes.

[0108] Table 1 shows comparative tensile strength of backing of present invention and two latex treated papers. The tensile strength was tested in machine direction and cross direction with UTM INSTRON machine pulled at 305 mm/min, at dry and wet conditions. The backing 225 mm long with width of 24 mm was used for testing tensile strength. The tensile strength of backing was tested under ASTM standard D3759. The test conditions were

[0109] 1. Gauge length—100 mm.

[0110] 2. Cross head velocity—300 mm/min.

[0111] Measurements made in machine direction are specified as (MD) data. Machine direction means that the measurement was made on the backing held in vertical direction. The cross direction (CD) data were taken in the cross direction or the horizontal direction.

TABLE 1

Max Load (kgf)	MD Dry	MD Wet	CD Dry	CD Wet
NW T4 treated	6.86	6.84	3.98	4.43
NW T4 treated Primed	7.79	7.68	3.81	4.21
Paper 135 gsm	20.56	8.58	17.04	6.88
Paper 100 gsm	15.49	6.00	10.81	3.66

[0112] Table 2 data shows a drop in tensile strength of non-woven polypropylene fabric and latex treated papers in wet condition, by soaking the non-woven polypropylene fabric and latex treated papers in water for 60 minutes.

TABLE 2

% drop in Max load	MD (%)	CD (%)
NW T4 treated	0.3	−11.2
NW T4 treated Primed	1.3	−10.4
Paper 135 gsm	58.3	59.6
Paper 100 gsm	61.3	66.2

[0113] In dry conditions, maximum load for latex treated papers is in higher range as compared to non-woven backing in both machine direction and cross direction. In wet conditions, the tensile strength of latex treated papers and non-woven backing is comparable. Non-woven backing shows very low/or almost no drop in tensile strength under wet conditions, as compared to paper backing which shows the substantial drop in tensile strength under wet condition. The non-woven backing was least impacted by wet condition.

[0114] Table 3 shows the percentage of tensile elongation in machine direction and cross direction with UTM INSTRON machine pulled at 305 mm/min, at dry and wet conditions. The tensile elongation of non-woven fabric is higher as compared to latex treated paper. Better tensile elongation in non-woven backing makes the abrasive articles resistant to piercing during usage in wet or dry sanding application.

TABLE 3

	Tensile Elongation in %			
Tensile Elongation (kgf)	MD Dry	MD Wet	CD Dry	CD Wet
NW T4 treated	127.23	122.59	124.88	126.40
NW T4 treated Primed	138.94	149.19	111.58	113.70

TABLE 3-continued

Tensile Elongation in %				
Tensile Elongation (kgf)	MD Dry	MD Wet	CD Dry	CD Wet
Paper 135 gsm	5.42	14.06	12.03	18.64
Paper 100 gsm	4.91	10.17	12.19	15.92

Bending Stiffness

[0115] Strips of backing were used for testing the bend stiffness, as provided below in Table 4. The bending stiffness is comparable for both latex treated paper and non-woven fabric. The bending stiffness test was carried out using Shirley stiffness tester using cantilever principle.

[0116] The non-woven backing was cut into to sheets of dimension 6 inch×1 inch with the aid of the template. Both the template and non-woven backing were transferred to the platform of Shirley stiffness tester, with the non-woven backing underneath and pushed forward. The strip of the non-woven backing will commence to droop over the edge of the platform and the movement of the template and the non-woven backing is continued until the tip of the non-woven backing is viewed in the mirror cuts both index lines. The bending length can immediately be read off from a scale mark opposite a zero line engraved on the side of the platform. The non-woven backing is tested four times, at each end and again with the strip turned over. The mean values for the bending length in warp and weft directions were then calculated.

TABLE 4

Bending Length (mm)		
Bending length (mm)	MD	CD
NW T4 treated	38.33	34.33
NW T4 treated Primed	42.83	34.17
Paper 135 gsm	45.00	39.83
Paper 100 gsm	37.33	31.83

Tear Strength

[0117] Test for tear strength of the backing obtained in Example 1 was carried out using Elmendorf tear test ASTM D1922. The Elmendorf tear test employs a pendulum to apply energy sufficient to tear through a fixed length of fabric. The tear is a single-rip tongue-type tear. The tester consists of a sector-shaped pendulum, carrying a clamp which is in alignment with a fixed clamp when the pendulum is in the raised, starting position having maximum potential energy. A rectangular fabric specimen is fastened in the clamps and a slit made to start the tear. The pendulum is then released and the specimen tears as the moving jaw separates from the fixed jaw. The energy required to tear is the potential energy difference at the beginning and end of the pendulum swing, and is measured by the position of the pendulum at the end of the test.

[0118] Table 5 shows the test strength profile for the non-woven backing is much higher than latex treated papers.

TABLE 5

Elmendorf tear strength (gms)		
Elmendorf tear strength (gms)	MD	CD
NW T4 treated	384	1248
NW T4 treated Primed	512	1376
Paper 135 gsm	128	128
Paper 100 gsm	64	64

Curl Resistance

[0119] FIG. **2** shows the curl resistance behavior of the abrasive article with backing layer comprising non-woven polypropylene fabric saturated with acrylic emulsion in comparison to the abrasive article comprising paper based backing layer when dipped in water. Table 6 shows the curl resistance behavior of the backing layer comprising non-woven polypropylene fabric saturated with acrylic emulsion in comparison with backing layer made of latex treated paper of 100 gsm, when dipped in water. The size of the above mentioned backing layers were 10 cm×10 cm. The backing layers were checked for curling at duration of 5 minutes, 15 minutes and 30 minutes. The paper based backing layer of 100 gsm curled immediately after 5 minutes and the backing comprising non-woven polypropylene fabric saturated with acrylic emulsion did not curl even after duration of 30 minutes in water at 25° C.

TABLE 6

Curl Resistance			
	Time		
Backing Type	5 Minutes Diameter of Curl	15 minutes Diameter of Curl	30 minutes Diameter of Curl
Paper 100 gsm	2.7 cms	1.8 cms	1.4 cms
NW T4 Treated Primed	Flat	Flat	Flat

1. An abrasive article comprising:

a) a non-woven backing; and

b) one or more layers of abrasive slurry deposited over the backing,

wherein said non-woven backing is impregnated with an acrylic emulsion and wherein the abrasive slurry comprises of one or more mineral particles and binder.

2. The article as claimed in claim **1**, wherein the non-woven backing is selected from a group consisting of polymer materials.

3. The article as claimed in claim **2**, wherein the polymer material is spun-bonded polypropylene fabric.

4. The article as claimed in claim **1**, comprising more than one layer of abrasive slurry deposited over the backing.

5. The article as claimed in claim **4**, wherein the mineral particles are coarser in outermost layer of abrasive slurry and gradually decreases to finer particles in layers of abrasive slurry towards backing.

6. The article as claimed in claim **1**, wherein the mineral particles are selected from a group consisting of silicon carbide, aluminium oxides, chromia, alumina zirconia, diamond, iron oxide, ceria, cubic boron nitride, boron carbide, garnet and combinations thereof

7. The article as claimed in claim **1**, wherein the binder comprises of a resin, filler and/or a curing agent.

8. The article as claimed in claim **7**, wherein the resin is selected from a group consisting of thermal curable phenolics, oil modified alkyds, thermal curable epoxies or UV-curable epoxy-acrylate.

9. The article as claimed in claim **7**, wherein the filler is selected from a group consisting of clay, silica, talc, calcium carbonate or mixtures thereof.

10. The article as claimed in claim **7**, wherein the curing agent is selected from a group consisting of thermal curing agents, UV curing agents or combinations thereof.

11. A backing for abrasive article comprising non-woven spun-bonded polypropylene fabric impregnated with acrylic emulsion

12. The backing as claimed in claim **11**, wherein the acrylic emulsion is selected from a group consisting of SBR latex, Nitrile latex, vinyl latex, acrylated urethanes, acrylated acrylics, acrylated epoxies, aminoplast derivatives having pendant alpha, beta unsaturated carbonyl groups, isocyanurate derivatives having at least one pendant acrylate group, isocyanate derivatives having at least one pendant acrylate group, acrylated polyesters, and mixtures thereof.

13. The backing as claimed in claim **11**, wherein the acrylic emulsion optionally comprises of at least one filler.

14. A process for preparing the backing as claimed in claim **11** comprising:

a) providing a non-woven spun-bonded polypropylene fabric;

b) surface treating or priming the fabric; and

c) impregnating the fabric with an acrylic emulsion.

15. A coated abrasive article comprising the backing as claimed in claim **11** and one or more layers of abrasive slurry deposited over the backing.

16. The article as claimed in claim **1**, in the form of a sheet, disc or a roll, resistant to curling and piercing.

17. A process of preparing an abrasive article comprising the steps of:

a) depositing abrasive slurry comprising one or more mineral particles and binder over a backing as a layer;

b) heating the abrasive slurry deposited over the backing; and

c) curing the abrasive slurry deposited over the backing;

d) optionally

e) repeating steps (a) to (c) to obtain one or more layers of abrasive slurry over backing;

f) coating the cured abrasive slurry with a stearate formulation.

18. The process as claimed in claim **17**, wherein said backing is selected from a group consisting of non-woven materials.

19. The process as claimed in claim **17** wherein said backing is impregnated with an acrylic emulsion.

20. The process as claimed in claim **17**, wherein said non-woven material is spun-bonded polypropylene fabric.

21. The process as claimed in claim **19**, wherein the backing is primed or surface treated prior to impregnation with acrylic emulsion.

22. The process as claimed in claim **17**, wherein the deposition of abrasive slurry over the backing is carried out by techniques selected from roll coating, spray coating, screen printing, roto gravure printing, knife coating or a combination thereof.

23. The process as claimed in claim **17**, wherein the heating is performed at a temperature in range of 50° C. to 150° C.

24. The process as claimed in claim **17**, wherein the curing is performed by thermal curing or UV curing, or a combination thereof.

25. The process as claimed in claim **17**, wherein the stearate formulation comprises calcium stearate and/or zinc stearate.

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