ADHESIVE CORE CHENILLE YARNS AND FABRICS AND MATERIALS FORMED THEREFROM

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Related U.S. Application Data
Continuation-in-part of application No. 11/464,633, filed on Aug. 15, 2006.

Publication Classification

Int. Cl.
D02G 3/42 (2006.01)
D03D 23/00 (2006.01)

U.S. Cl. ......................... 28/144; 139/395; 57/203; 57/24

ABSTRACT

The present invention is directed to chenille yarns, fabrics prepared therefrom, and items formed therewith. The chenille yarns comprise an adhesive component that is incorporated into the yarn in such a way that the yarns, and the fabrics made therefrom, exhibit excellent physical characteristics, particularly abrasion resistance.
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CROSS-REFERENCE TO RELATED APPLICATIONS


FIELD OF THE INVENTION

[0002] The present invention relates to chenille fibers and yarns. More particularly, the invention relates to chenille fibers and yarns having cores formed of an adhesive component.

BACKGROUND OF THE INVENTION

[0003] Chenille is commonly understood to be a yarn formed of short lengths of spun yarn or filament (known as pile, or pile yarn, or effect yarn) held together by two core filaments that are tightly twisted and typically formed of a fine, strong yarn. Chenille yarn has been produced commercially for many years and continues to gain in popularity in light of its rich yet soft texture that provides a pleasing and desirable feel. Chenille yarn can be difficult to manufacture because of the great care required in its production to ensure pile completeness (or lack of missing pile) and sufficient strength-to-bulk relationship.

[0004] Chenille yarn is used in fabrics to form a variety of products where a luxurious effect is desired. The breadth of application of chenille fabrics has traditionally been limited, though, by its inherent delicate nature. The pile that gives chenille its velvety feel is typically maintained in the yarn by friction applied by the twisted core yarns, and the pile is thus subject to removal by any force sufficient to overcome the friction supplied by the core yarns. This ability to resist withdrawal of the pile from the chenille yarn is commonly known as abrasion resistance. Low abrasion resistance has limited the use of known chenille yarns in many products where the richness of chenille is desired, such as commercial and residential upholstery fabrics, automotive fabrics, and other products where frequent use limits the lifespan of the product because of pile loss.

[0005] Attempts have been made to improve the abrasion resistance and to decrease the amount of pile loss associated with chenille yarns. In particular, adhesives have recently been used to secure pile or effect yarns to the chenille yarn core. For example, U.S. Pat. No. 5,651,168 discloses chenille yarns formed using a low-melting binder filament as one or more of the core filaments of the chenille yarn. After formation, the yarn is heat-set to melt the low-melting binder filament and thus adhesively secure the pile or effect yarns to the core. Such attempts at increasing abrasion resistance have still, however, failed to provide a chenille yarn of sufficient quality for the demands of many commercial and residential products. Thus, there still remains a need in the art for chenille fibers and yarns, and fabrics made therefrom, having improved abrasion resistance.

BRIEF SUMMARY OF THE INVENTION

[0006] The present invention provides chenille yarns comprising an adhesive component that is incorporated into the yarn is such a way that the yarns, and the fabrics made therefrom, exhibit excellent physical characteristics, particularly abrasion resistance. Accordingly, the invention provides chenille yarns, chenille fabrics, and methods of preparing chenille yarns and fabrics.

[0007] In one aspect, the invention is directed to chenille yarns. The yarns incorporate an adhesive component but, unlike known chenille yarns, the adhesive component improves the physical characteristics of the yarn far beyond what has previously been achieved. Particularly, the adhesive leads to these properties because of its chemical makeup and/or because of the method of incorporating the adhesive into the overall yarn structure.

[0008] In one embodiment, a chenille yarn according to the invention comprises a first core yarn, a second core yarn, portions of at least one effect yarn positionedly maintained by and extending radially from the core yarns, and an adhesive component. Multiple types of adhesives can be used according to the invention.

[0009] In a preferred embodiment, the adhesive component comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight that is less than the first molecular weight of the at least one polymer of the first blend component. Preferentially, the polymer blend substantially wets a surface at a flow activating temperature without requiring the application of pressure. The flow activating temperature can vary according to the invention, such as in the range of about 50°C to about 200°C, which is further described below.

[0010] In addition to the above, further preferred embodiments of the invention provide for the first molecular weight of the polymer of the first blend component to be sufficiently high so as to prevent its substantial wet out at the activating temperature without the application of pressure. It is further preferred for the second molecular weight of the compound of the second blend component to be sufficiently low so that the compound exhibits sufficiently high molecular mobility to prevent processing of the compound alone (i.e., without being blended with another compound).

[0011] In particular embodiments, the polymer blend used as the adhesive component in the invention can exhibit further preferential properties. For example, the polymer blend preferentially wets out a surface at the activating temperature without requiring the application of pressure in a time of about two minutes or less. Further, the first blend component can comprise at least one polymer having a molecular weight that is at least about three times higher than the molecular weight of the compound of the second blend component. Also, the first blend component can comprise at least one polymer having a first melt flow rate, and the second blend component can comprise at least one compound having a second melt flow rate that is greater than the first melt flow rate. In specific embodiments, the polymer blend comprises at least one elastomeric polymer and/or a substantially crystalline or semicrystalline polymer. The polymer blend can also comprise a functionalized polymer. In preferred embodiments, one or both of the blend components comprises a polyolefin. Moreover, the polyolefin can comprise a maleic anhydride modified polyolefin.
The adhesive component can be introduced into the chenille yarn by a variety of methods. In one embodiment, the adhesive component is in the form of a third core yarn. In further embodiments, the adhesive component comprises a coating on at least a portion of at least one of the core yarns. In specific embodiments, at least one of the core yarns comprises a multicomponent fiber, and the adhesive component comprises at least one component of the multicomponent fiber. For example, the multicomponent fiber can comprises a core-sheath fiber, and the adhesive component can comprise the sheath.

The chenille yarn can particularly be characterized by the abrasion resistance imparted by the overall composition and combination of the components. Particularly, the abrasion resistance can be evaluated in terms of a specific fabric prepared using the chenille yarn. In one embodiment, a fabric can be prepared using a chenille yarn according to the invention having a weight of 1250 yards/pound and being formed into a fabric having a weight of 13.5 ounces per linear yard, having 20 warp ends per inch, having 13.5 picks per inch, and having a 2 ounce per linear yard acrylic latex backing applied thereto. Of course, the chenille yarn could be formed into any number of various fabrics having various parameters. The noted fabric parameters were simply used to set a standard that is easily reproducible by one of skill in the art to compare a fabric prepared using a chenille yarn to the fabric prepared using the chenille yarn of the invention. The fabric prepared using the chenille yarn of the invention is tested for an abrasion resistance according to the method of ASTM D-4157, which measures abrasion resistance in double strokes (or double rubs). Thus, a competing chenille yarn would be compared to the present chenille yarn by forming a fabric exactly as outlined above and then subjecting the fabric to the test of ASTM D-4157 (also known as the Wyzenbeek abrasion test).

Preferably, chenille yarns of the present invention, when formed into a fabric, such as described above, exhibit an abrasion resistance according to ASTM D-4157 of at least about 50,000 double strokes. As described below, a fabric prepared as described above using the chenille yarn of the present invention exhibited an abrasion resistance in excess of 100,000 double strokes. Such performance is typical of fabrics prepared using the chenille yarn of the invention.

In a specific embodiment, the chenille yarn of the invention comprises a first core yarn, a second core yarn, portions of at least one effect yarn positionedly maintained by and extending radially from the core yarns, and an adhesive component. In this embodiment, at least one of the first and second core yarns comprises a continuous sheath/core filament, the sheath comprising the adhesive component. It has heretofore not been possible to provide an adhesive component into a chenille yarn as part of a multicomponent fiber. The present invention, however, is able to provide chenille yarns and fabrics having the exceptional physical properties described herein, at least partially, in light of the recognition of how to achieve this feat. The exceptional abilities can likewise arise from the specific adhesives that used in preparing the sheath of the multicomponent filament. In particular, any of the adhesive systems described herein can be used in the multicomponent fiber to achieve the results of the invention.

In a further aspect, the invention also provides a fabric comprising a chenille yarn according to the invention. In particular, the chenille fabric can be prepared using any of the embodiments of chenille yarns described herein.

In still another aspect, the invention provides a variety of products of manufacture comprising a chenille fabric according to the invention or a chenille yarn according to the invention. Such products of manufacture can only be prepared from chenille yarns and fabrics in light of the increased abrasion resistance provided according to the invention.

In yet another aspect, the invention provides methods for preparing chenille yarns. In particular, the invention provides methods for preparing pre-bonded chenille yarns. The lack of stability that plagues conventional chenille yarns makes it difficult to prepare fabrics from the yarns using high energy methods. The present invention overcomes this problem by providing pre-bonded chenille yarns.

In one embodiment, the method of the invention comprises feeding at least two core yarns and an effect yarn into a chenille machine, wherein at least one of the core yarns comprises continuous sheath/core filament, and the sheath comprises an adhesive. The method further comprises entangling the core yarns and the effect yarn in the chenille machine, removing a non-bonded chenille yarn, feeding the non-bonded chenille yarn into an adhesive activation chamber, and heating the non-bonded chenille yarn sufficiently to activate the adhesive and adhesively bond the effect yarn to the core yarns, thereby forming a pre-bonded chenille yarn. The invention provides multiple methods for continuously heating the yarn to active the adhesive.

In light of the method of forming the pre-bonded chenille yarns, it is also possible according to the invention to prepare fabrics using high energy methods. For example, in one embodiment, the invention provides a method of air jet weaving a chenille fabric. In a preferred embodiment, the method comprises feeding a pre-bonded chenille yarn, such as prepared according to the method described above into an air jet weaving apparatus. By this method, it is possible to prepare an air jet woven fabric without the loss of substantial amounts of effect fiber (i.e., amounts that would noticeably affect the appearance of the fabric).

BRIEF DESCRIPTION OF THE DRAWINGS

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and in which:

FIG. 1 is a cross-section illustrating a multicomponent fiber according to one embodiment of the invention, wherein the fiber is in a sheath/core configuration;

FIG. 2 is a cross-section illustrating another embodiment of a sheath/core fiber according to the invention;

FIG. 3 is a cross-section illustrating yet another embodiment of a sheath/core fiber according to the invention, wherein the core is offset within the sheath;

FIG. 4 illustrates still another embodiment of a sheath/core fiber according to the invention, wherein the sheath and the core exhibit different geometries in cross-section;
FIG. 5 also illustrates another embodiment of a sheath/core fiber according to the invention, wherein the sheath and the core exhibit different geometries in cross section;

FIG. 6 is a cross section illustrating another embodiment of a sheath/core fiber of the invention, wherein the sheath and core are of similar rectangular geometry;

FIG. 7 is a cross-section of an islands-in-the-sea embodiment of a multicomponent fiber of the invention;

FIG. 8 is cross-sectional view of a segmented, round embodiment of a multicomponent fiber of the invention;

FIG. 9 is cross-sectional view of a segmented, multi-lobal embodiment of a multicomponent fiber of the invention;

FIG. 10 is a schematic illustration of an exemplary process for making a multicomponent fiber according to the invention;

FIG. 11 is a schematic illustration of one embodiment of a process for making a chenille yarn according to the invention;

FIG. 12 is a schematic illustration of another embodiment of a process for making a chenille yarn according to the invention; and

FIG. 13 is a schematic illustration of one embodiment of a process for making a chenille fabric according to the invention.

### DETAILED DESCRIPTION OF THE INVENTION

The present inventions now will be described more fully hereinafter with reference to specific embodiments of the invention and particularly to the various drawings provided herewith. Indeed, the invention may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. As used in the specification, and in the appended claims, the singular forms “a”, “an”, “the”, include plural referents unless the context clearly dictates otherwise.

The present invention provides chenille yarns and fabrics made with such yarns. The invention likewise encompasses a variety of products of manufacture that can be made using the chenille yarns and fabrics of described herein. The present invention surpasses chenilles known in the field by providing a level of abrasion resistance, or effect yarn stability, heretofore unknown in the textile arts. Thus, the present invention provides chenille yarns and fabrics that can be used not only in conventional applications of chenille where the soft, velvety texture is desirable but wear is minimal, but also in applications where the soft, velvety texture is also desirable but where high use and wear are expected. In fact, the chenille products of the present invention provide a level of durability and abrasion resistance allowing for use of chenille in applications, such as automobile upholstery, commercial and residential seating (such as chairs and sofas), and personal use items that must withstand multiple launderings (such as bedding and clothing). Specific examples of heavy-duty installations where chenille fabrics having the durability provided by the present invention may be used include the following: upholstery in hotel rooms/suites, conference rooms, dining area usage, 24-hour transportation terminals, 24-hour telemarketing, 24-hour healthcare emergency rooms, 24-hour casino gambling areas, and such public gathering places as theatres, stadiums, lecture halls, and fast food restaurants. Of course, the chenille products of the invention also include more conventional chenille items, such as residential fabrics and apparel fabrics. These more typical applications include, but are not limited to, decorative throws, upholstery fabrics, blankets and quilts. The fabrics of the invention are machine washable or dry cleanable, unlike conventional chenille fabrics.

As noted above, the invention also comprises a variety of products of manufacture incorporating fabrics and yarns are described herein. For example, the invention encompasses automobiles incorporating upholstery comprising chenille fabric or yarn as described herein; commercial and residential seating (including chair and sofas) upholstered with chenille fabric or yarn as described herein; and commercial and residential bedding material incorporating chenille fabric or yarn as described herein.

Increased durability and diversity of use are provided by the invention through incorporation of an adhesive system into the core of the chenille yarn. As pointed out above, other have tried to improve chenille yarn durability through the use of adhesives; however, these previous attempts have failed to achieve the surprising and superior results of the present invention. The improved performance provided by the present invention, in certain embodiments, arises from the realization that an adhesive must be delivered via a system effective to bond fibers many fiber diameters removed from where the binder is applied, and that flow characteristics can be increasingly important for the performance of the end product. In the manufacture of chenille yarns, twisted pairs of a core yarn typically hold in place bundles of effect yarn at an angle substantially perpendicular to the core yarn. A binder applied via the core yarn advantageously has enough flow to penetrate to a depth of dozens of fiber diameters, yet stop short of wicking out the length of the effect yarn and so causing it to stiffen. Thus, the present invention preferably uses binder materials having the necessary flow and other characteristics described herein as useful to maximize the binding of the effect yarn without sacrificing the desirable touch and feel characteristics of chenille materials.

In one aspect, the present invention provides a chenille yarn. The chenille yarn comprises at least one core yarn, preferably at least a first core yarn and a second core yarn. A core yarn, as used herein, is understood to refer to a single fiber or continuous filament or a plurality of fibers that are combined to form a continuous element. Accordingly, the chenille yarns of the present invention also comprise at least one effect yarn positionedly maintained by and extending radially from the core yarns. The effect yarn can generally comprise any material typically useful in the textile fields, as more fully described below. While the core yarns can be continuous, the effect yarns are preferably of finite length. The chenille yarns of the invention also comprise an adhesive component. In specific embodiments, the core yarns are twisted together with one or more effect yarns...
positioned therebetween and trapped by the core yarns. The adhesive component then strengthens the entrapment of the effect yarn by binding the effect yarn to the core yarn.

[0040] The chenille yarns of the present invention are characterized by the improved properties exhibited by the yarns and the materials made therewith. In particular, the chenille yarns of the invention provide chenille fabrics having improved abrasion resistance. Abrasion is generally understood to refer to the surface wear of a fabric caused by rubbing and contact with another fabric. In relation to chenille fabrics, abrasion often manifests in the form of loss of effect yarns, commonly referred to as “balding.” Thus, abrasion resistance, as used herein, can refer to the resistance to loss of effect yarn.

[0041] Abrasion resistance can specifically be determined using the method of ASTM D4157-02 from the American Society of Testing and Materials, which method is also known as the Wyzenbeek abrasion test or the “double rub” test. According to ASTM D4157-02, a Wyzenbeek machine is used, allowing samples of the test fabric to be pulled tight in a frame and held stationary. Individual test specimens cut from the warp and weft direction are then rubbed back and forth using a specified abradant. One cycle is counted as a rub across the fabric sample and then another rub back across the sample to the starting position (i.e., a double rub). The number of double rub cycles achieved before two yarn breaks occur, or noticeable wear is observed, is recorded as the fabric’s abrasion rating. Thus, the abrasion resistance of a material is described in terms of the number of double rubs before failure is achieved under the Wyzenbeek abrasion test.

[0042] Chenille fabrics have typically been plagued by low double rub values. Known fabrics formed of conventional chenille yarns have double rub values in the range of about 5,000 to about 6,000. Efforts to improve this number have included the use of specific weaving techniques (such as the use of more filling yarns or slower loom speeds) and the use of highly bonded backing materials. Such efforts have failed to significantly improve abrasion resistance and/or have detrimentally affected the aesthetic properties of the chenille fabric. Even known attempts at using adhesives have failed to provide the results of the present invention reaching performance only in the range of about 15,000 double rubs without the addition of a latex backing material.

[0043] Fabrics prepared using the chenille yarns of the present invention, however, exhibit abrasion resistance that is far superior to the abrasion resistance previously known in the field. Example 1 provides a comparison between a chenille fabric of the invention and a chenille fabric known in the art. The chenille fabric known in the art required a backing material to provide any reasonable degree of abrasion resistance. Thus, to be consistent in the evaluation, the inventive fabric also included a backing material. However, the fabrics according to the present invention prepared with the chenille yarn described herein can be prepared without a backing material. Thus, the invention also encompasses chenille yarns without a backing attached thereto.

[0044] In specific embodiments, a fabric comprising the chenille yarn of the present invention exhibits an abrasion resistance according to ASTM D4157-02 of at least about 55,000 double rubs, at least about 60,000 double rubs, at least about 65,000 double rubs, at least about 70,000 double rubs, at least about 75,000 double rubs, at least about 80,000 double rubs, at least about 85,000 double rubs, at least about 90,000 double rubs, or at least about 95,000 double rubs. In one embodiment, a fabric prepared using the chenille yarn of the invention exhibits an abrasion resistance of at least about 100,000 double rubs or that exceeds 100,000 double rubs.

[0045] The present invention also provides for further improved properties. For example, in specific embodiments, a fabric prepared using the inventive chenille yarn exhibits improved tenacity. Preferably, a fabric prepared using a chenille yarn as described herein exhibits a tenacity of at least about 60 pounds in the warp direction. More preferably, the fabric exhibits a tenacity in the warp direction of at least about 70 pounds, at least about 80 pounds, at least about 90 pounds, at least about 100 pounds, or at least about 110 pounds. Any method recognized in the art as useful in evaluating fabric tenacity can be used according to the invention.

[0046] The inventive fabric also exhibits improved seam slippage values. In one embodiment, the inventive fabric can withstand a load of at least about 35 pounds in the warp direction prior to onset of seam slippage. In further embodiments, the fabric can withstand a load in the warp direction prior to seam slippage of at least about 40 pounds, at least about 45 pounds, or at least about 50 pounds. Any method recognized in the art as useful in evaluating fabric seam slippage can be used according to the invention.

[0047] Still further, the inventive fabric exhibits improved seam strength. In one embodiment, the inventive fabric has a seam strength in the warp direction of at least about 55 pounds. In further embodiments, the fabric has a seam strength in the warp direction of at least about 60 pounds, at least about 65 pounds, at least about 70 pounds, at least about 75 pounds, at least about 80 pounds, or at least about 85 pounds. Any method recognized in the art as useful in evaluating fabric seam strength can be used according to the invention.

[0048] In addition to the improved properties provided by the invention, the chenille yarns of the invention are further characterized by the flexibility in the methods of preparation. Specifically, the adhesive component can be incorporated into the core yarns in a variety of ways while still achieving the desired performance parameters. In fact, in certain embodiments where specific adhesive systems as described herein are used, the adhesive component can be incorporated into the core yarn using any suitable techniques known in the art.

[0049] In one embodiment, the chenille yarn can comprise at least two core yarns, and one of the core yarns can be formed completely of the adhesive component. When a core yarn is comprised completely of the adhesive component, it is preferable that the chenille yarn comprise at least three core yarns. In such embodiments, the core yarn comprising the adhesive can be formed of a single fiber or can comprise a plurality of fibers, wherein each of the fibers is formed completely of the adhesive component. As used herein, the term “fiber” is understood to encompass fibers of finite length, such as conventional staple fiber, as well as substantially continuous structures, such as filaments.
Similarly, the chenille yarn can comprise at least two core yarns wherein at least one of the core yarns is a blend of materials, and wherein at least part of the individual core yarn comprises the adhesive component. For example, the core yarn could be a single fiber formed of a homogeneous blend of polymeric materials, wherein at least a portion of the polymeric materials making up the blend comprises the adhesive material. A plurality of such fibers could be used to form the core yarn as well, wherein one or more of the fibers are formed of the blend. Blended yarns can be formed by a variety of methods, including extrusion of different filaments from a common spinneret, by blending of pure or blended yarns after extrusion, or by spinning yarns from mixtures of staple fibers.

In another embodiment, the chenille yarn can comprise a core yarn formed of a plurality of fibers wherein at least one fiber of the yarn is formed of the adhesive component and at least one fiber of the same yarn is formed of a polymeric component that is not the adhesive component. The chenille yarn can comprise two or more core yarns having such a composition. This is particularly useful in that the precise adhesive component content necessary to provide the desired adhesive effect can be achieved (i.e., avoiding use of excess adhesive and avoiding insufficient adhesion). Moreover, the non-adhesive fibers remain to add to the overall strength and structure of the chenille yarn.

In still another embodiment, the chenille yarn can comprise at least one core yarn that is at least partially coated with the adhesive component. In such embodiments, the core yarn can comprise a single fiber that is at least partially coated with the adhesive. Further, the core yarn can comprise a plurality of fibers. When a plurality of fibers is used, the adhesive coating can be on individual fibers of the yarn. The adhesive coating can also be applied to the bundle of fibers as a whole, meaning that the outermost fibers would be at least partially coated, but some fibers forming the yarn may have no adhesive material coating. Coating of the yarn with the adhesive component can be by any method known in the art as useful in coating fibers or yarns, such as spraying or dipping.

The chenille fiber can also comprise core yarns formed of staple fibers that are combined to form a continuous yarn. In such embodiments, the adhesive component can be used to form at least a portion of the staple fiber used in making the core yarn. Such yarns formed of staple fibers can be used solely as the core yarns according to the invention or can be combined with core yarns (without or without an adhesive component) according to any of the remaining embodiments described herein.

In yet another embodiment, the chenille yarns can comprise core yarns formed of multicomponent fibers. A great variety of conformations for the multicomponent fiber of the invention are envisioned wherein an adhesive component is co-extruded with a different fiber-forming material that does not function as an adhesive component according to the invention, and some of the preferred embodiments are described below with reference to the various Figures. Of course, the skilled artisan, with the benefit of the present disclosure, may envision further conformations that are in accordance with the present invention, and such further conformations are fully encompassed herein.

The multicomponent fibers according to the invention comprise the adhesive component in a manner such that the adhesive component is physically available to adhesively interact with the remaining components of the chenille yarn. Preferably, the adhesive forms at least a portion of the outer surface of the multicomponent fiber. Thus, any multicomponent fiber conformation is encompassed to the extent that the adhesive comprises at least a portion of the outer surface of the fiber.

In one particular embodiment of the invention, the multicomponent fiber is in the form of a sheath/core fiber. FIG. 1 generally illustrates such an embodiment by showing a cross-section of a sheath/core fiber having a core encapsulated by a sheath. Preferably, the sheath extends substantially the length of the fiber and comprises an adhesive component according to the invention. When used in forming a chenille yarn as further described herein, the sheath is subject to a physical change, such as melting, to perform the adhesive function. Thus, the core is at least partially exposed. This is particularly beneficial in that a single fiber comprising the core yarn component and the adhesive component can be prepared and used in making the chenille yarn. Once the adhesive component has been melted, the core remains to provide structural integrity to the chenille yarn. In a particular embodiment, a multicomponent fiber, as described herein, can be combined with other core yarns that do not include an adhesive component. Thus, the multicomponent fiber functions to provide the adhesive and provide further structural strength to the overall chenille yarn.

Moreover, as further described below, the present invention provides the advantage of specific adhesives systems that allow for optimal bonding of the chenille yarn components without making the chenille yarn, or fabric prepared from the yarn, undesirably stiff. Therefore, known attempts at including adhesives in chenille yarns have unsuccessfully tried to balance the durability of the chenille (i.e., the abrasion resistance) with the desirable feel of the chenille (i.e., the softness and velvety touch). In order to achieve improved durability (which still does meet the durability of the present invention), known attempts have relied on adding a significant quantity (i.e., an “excess”) of binder polymer available, for example, by including a full core yarn dedicated to the binder. The unique adhesives of the present invention have specific characteristics that overcome these difficulties, and this aspect of the invention is further described below.

The present invention is likewise beneficial, though, in that the reduced adhesive requirement to achieve an even better abrasion resistance can be provided in manners, such as using multicomponent fibers. Such fibers generally provide a much smaller overall content of adhesive to the system, which avoids any problems associated with undesirable stiffness, or other undesirable aesthetic qualities. Known methods of preparing chenille yarns cannot provide a binder as part of a multicomponent fiber (e.g., a core/sheath fiber) because such a fiber simply would not deliver enough adhesive to achieve the desired end result—improved durability (e.g., abrasion resistance). As the adhesive systems of the present invention are optimized for bonding but do not risk stiffening problems, the present invention achieves effective bonding with less binder polymer present. Furthermore, the flow characteristics of the present adhesive systems allow bonding at temperatures that are sufficiently below the softening temperature of the
binder polymer (or adhesive component) that avoids undesirable shrinkage of the non-binder components of the multicomponent fiber. Thus, it is only according to the present invention that it is possible to provide an adhesive in a chenille yarn in a content effective to provide the desired durability.

[0059] The invention encompasses multiple different embodiments of a sheath/core fiber. As shown in FIG. 1, the core 10 is concentrically positioned within, and encapsulated by, the sheath 15, and the core 10 comprises approximately 75% by weight of the fiber 5. Of course, the core can comprise a greater or lesser amount of the overall fiber weight. Further, while the core is shown substantially centered within the sheath, such is not required.

[0060] A sheath/core fiber, according to the invention, can also take on a variety of cross-sectional geometries. For example, the sheath/core fiber could have a cross-section that is a circle, oval, triangle, rectangle, octagon, pentagon, trapezoid, or the like. Furthermore, in cross-section, the sheath could have one geometry while the core has a different geometry. In further embodiments, the sheath/core fiber could also be multi-lobal.

[0061] Non-limiting examples of various sheath/core fiber embodiments encompassed by the invention are provided in FIG. 2 through FIG. 6. FIG. 2 illustrates a sheath/core fiber 5, wherein the core 10 is concentric to the sheath 15 encapsulating the core 10, but wherein the core 10 comprises a smaller percentage of the overall fiber as compared to the fiber illustrated in FIG. 1. FIG. 3 illustrates a sheath/core fiber 5, wherein the core 10 is off-center within the sheath 15. FIG. 4 illustrates a sheath/core fiber 5, wherein the core 10 has a triangular geometry while the sheath 15 encapsulating the core 10 has a circular geometry. FIG. 5 illustrates a sheath/core fiber 5, wherein the core 10 has a rectangular geometry while the sheath 15 encapsulating the core 10 has a circular geometry. FIG. 6 illustrates a sheath/core fiber 5, wherein the core 10 and the sheath 15 encapsulating the core 10 both have a rectangular geometry.

[0062] In another particular embodiment of the invention, the multicomponent fiber is in the form of an islands-in-the-sea fiber. According to such an embodiment, a plurality of island members is positioned within and extending through substantially the length of the fiber, wherein each of the island members is separated from one another. The island members comprise a polymer useful for forming a core yarn, as described herein, and are each encapsulated by an outer fiber component comprising an adhesive component according to the invention.

[0063] FIG. 7 illustrates a multicomponent fiber of the invention according to an islands-in-the-sea embodiment. The cross-sectional view shows a plurality of islands (10, 11, 12, 13, and 14) encapsulated by an outer fiber component 15. The islands can each comprise the same polymeric material or can comprise different polymers. This embodiment is likewise beneficial in that the core yarn can be prepared to include the core yarn components as well as the adhesive component. Moreover, once the adhesive has been activated, such as by melting, the inner fiber components remain to provide structural integrity to the chenille yarn. Further, the presence of multiple, finer, core components can actually alter the physical characteristics of the overall chenille yarn, which can be beneficial.

[0064] The multicomponent fiber of the invention can also take on a number of structural configurations allowing for free dissociation of the individual fiber components. Generally, the fiber components are arranged so as to form distinct, unexclusive cross-sectional segments along the length of the fiber. In one such embodiment, the multicomponent fiber of the invention can take on a tie-wedge arrangement, such as that illustrated in FIG. 8. The tie-wedge fiber arrangement illustrated in FIG. 8 is a bicomponent filament 4 having eight alternating segments of triangular shaped wedges comprising the overall "pie". The wedges comprise a first fiber component 6 (which is formed of a material useful as a chenille core yarn, as described herein) and a second fiber component 8 (which comprises an adhesive component, as described herein). While the tie-wedge filament illustrated in FIG. 8 is a non-hollow fiber, the invention also encompasses FIG. 8 comprises eight wedge segments, it should be recognized that filaments according to the invention can comprise more or less than eight segments.

[0065] In addition to the tie-wedge configuration illustrated in FIG. 8, the multicomponent fiber of the invention can also take on other segmented, splittable fiber configurations. For example, the FIG. 9, which shows a round fiber 4 segmented into four alternating sections, comprising a first fiber component 6 (comprising a core yarn material) and a second fiber component 8 (comprising an adhesive component). Description of further multicomponent fiber construction that may be useful according to the present invention can be found in U.S. Pat. No. 5,108,820; U.S. Pat. No. 5,336,553; and U.S. Pat. No. 5,382,400; all of which are incorporated herein by reference.

[0066] The multicomponent fibers of the present invention are further advantageous in that they are not limited to configuration as conventional round fibers. Rather, the multicomponent fibers can take on other useful shapes. Generally, any shape for a segmented multicomponent fiber can be used so long as a fiber segment comprising the adhesive component according to the invention is present at the surface of the multicomponent fiber. For example, the inventive multicomponent fiber can take on a multilobal configuration, as illustrated in FIG. 9. Further description of multicomponent fibers of unconventional shape that may be useful according to the present invention can be found in U.S. Pat. No. 5,277,976; U.S. Pat. No. 5,057,368; and U.S. Pat. No. 5,069,970; which are all incorporated herein by reference.

[0067] Regardless of the various embodiments in which the multicomponent fiber can take on (i.e., sheath/core, islands-in-the-sea, tie/wedge, etc.), the multicomponent fiber still comprises an adhesive component-containing material and a separate fiber component capable of functioning as a core yarn. The overall composition of the multicomponent fiber can vary depending upon the application of the fiber. For example, if the multicomponent fiber is intended to provide all of the adhesive component, it may be desirable for the adhesive component sheath to form a majority of the overall fiber. However, in embodiments wherein multiple multicomponent fibers are included, it may be desirable for the sheath to comprise only a minor part of the overall fiber as the sum total of the sheaths in the multiple fibers will provide sufficient adhesive and the cores of the multicomponent fibers can provide sufficient strength to the chenille cores.
It is possible for the multicomponent fibers of the invention to be provided as staple fibers or other short forms. However, the invention is particularly useful in that continuous filaments, such as continuous sheath/core filaments, can be used as the multicomponent fiber component of the chenille yarn. This particularly allows for continuous processing of the chenille yarns from the formation of the multicomponent fibers to the completion of the chenille fabric.

The adhesive component of the fiber sheath, in particular embodiments, comprises between about 5% by weight and about 95% by weight of the multicomponent fiber. In further embodiments, the adhesive component comprises about 10% by weight to about 90% by weight of the multicomponent fiber, about 10% by weight to about 80% by weight, about 20% by weight to about 75% by weight, and about 25% by weight to about 85% by weight of the multicomponent fiber.

A multicomponent fiber according to the invention can be prepared using any of the fiber formation techniques as known in the art. An exemplary method for producing a multicomponent fiber is illustrated in FIG. 10, which illustrates a melt spinning line 20 for producing bicomponent fibers, and which includes a pair of extruders 22 and 24. As will be appreciated by the skilled artisan, additional extruders may be added to increase the number of components (for example, wherein a plurality of temperature-regulating inner fiber components are encapsulated by an outer fiber component in a sheath/core embodiment). Extruders 22 and 24 separately extrude an inner fiber component and an outer fiber component. The inner fiber component is fed into extruder 22 from a hopper 26 and the outer fiber component is fed into extruder 24 from a separate hopper 28. The inner fiber component and the outer fiber component are fed from extruders 22 and 24 through respective conduits 30 and 32 by a melt pump (not shown) to a spinneret 34.

The inner fiber component and the outer fiber component are preferably matched to allow spinning of the components through a common capillary at substantially the same temperature without degrading one of the components. The invention, however, should not be viewed as limited to combinations of inner fiber components and outer fiber components with substantially similar extrusion temperatures. Rather, the outer fiber component (e.g., an adhesive component) may have a relatively low extrusion temperature, and the inner fiber component (e.g., the chenille yarn core component) may have a relatively high extrusion temperature. Temperature disparity is only limited in that the extrusion temperature of the inner fiber component should be sufficiently low so as to not cause thermal degradation of the outer fiber component.

In one advantageous embodiment, polypropylene is used as the inner fiber component. In another useful embodiment, polyamide is used as the inner fiber component. In yet another embodiment, polyurethane is used as the inner fiber component. Some thermoplastic polyurethanes can be extruded at a temperature ranging from about 160° C. to about 220° C. Nylon 6, a particularly useful polyamide according to the invention, is typically extruded at a temperature ranging from about 250° C. to about 280° C. Polyethylene and polypropylene are typically extruded at a temperature ranging from about 200° C. to about 230° C.

Extrusion processes and equipment, including spinnerets, for making multicomponent continuous filament fibers are well known and need not be described here in detail. Generally, a spinneret includes a housing containing a spin pack which includes a plurality of plates stacked one on top of the other with a pattern of openings arranged to create flow paths for directing fiber-forming components separately through the spinneret. The spinneret has openings or holes arranged in one or more rows. The polymers are combined in a spinneret housing so that the extrudant has the desired overall fiber cross section (e.g., round, trilobal, etc.). The spinneret openings form a downw ardly extending curtain of filaments. Such a process and apparatus is described, for example, in U.S. Pat. No. 5,162,074, to Hills, which is incorporated herein by reference.

Following extrusion through the die, the resulting thin fluid strands, or filaments, remain molten for some distance before they are solidified by cooling in a surrounding fluid medium, which may be chilled air blown through the strands (not shown). Once solidified, the filaments are taken up on a godet or other take-up surface. For example, in a continuous filament process as illustrated in FIG. 10, the strands are taken up on godet rolls 36 that draw down the thin fluid streams in proportion to the speed of the take-up godet.

The core yarns used in the chenille yarns of the invention can be formed using a variety of materials. In most embodiments, the core yarn can comprise any polymeric material (or mixture thereof) that is capable of being formed into an elongated fiber. The polymeric material used in forming the core yarn of the chenille yarn can vary depending upon the process used in preparing the yarn. For example, when the core yarn is formed of extruded fibers, a melt spinning process may be used to form the fibers. Thus, the polymeric material is beneficially a melt-processable thermoplastic polymer, or mixture of polymers. According to other embodiments of the invention, the polymeric material can include an elastomeric polymer, or mixture of polymers.

The polymeric material used in preparing the core yarn of the inventive chenille yarn can comprise a polymer (or mixture of polymers) having a variety of chain structures that include one or more types of monomer units. In particular, a polymeric material may comprise a linear polymer, a branched polymer (such as a star branched polymer, a comb branched polymer, or a dendritic branched polymer), or a mixture thereof. A polymeric material may also comprise a homopolymer, copolymer, terpolymer, statistical copolymer, random copolymer, alternating copolymer, periodic copolymer, block copolymer, radial copolymer, or graft copolymer, or a mixture thereof.

In certain embodiment, a polymeric material useful in a core yarn for forming a chenille yarn according to the invention can be determined based upon the melting temperature of the polymeric material. In one particular embodiment, the core yarn comprises a polymeric material having a melting temperature of greater than about 100° C. In other embodiments, the core yarn comprises a polymeric material having a melting temperature of greater than about 125° C., greater than about 125° C., greater than about 130° C., greater than about 140° C., greater than about 150° C., greater than about 160° C., greater than about 175° C., greater than about 200° C., or greater than about 220° C.
By way of non-limiting example, various classes of polymers that may be used to form a core yarn according to the invention can include the following: polyamides, polyamines, polyimides, polyacrylics, polycarbonates, polydienes, polyepoxides, polyesters, polyfluorocarbons, polyolefins, polyphenylene, silicon containing polymers, polyurethanes, polyvinyls, polyacetal, polyarylates, copolymers thereof, terpolymers thereof, and mixtures thereof. Non-limiting examples of specific polymeric materials useful as the outer fiber component according to the present invention include the following: Nylon 6, Nylon 6/6, Nylon 12, polysparatic acid, polyglyutamic acid, polycrlyamide, polycrlylonitrile, esters of methacrylic acid and acrylic acid, polyisophenol A carbonate, polypropylene carbonate, polybutadiene, polyisoprene, polyisobutene, polyethylene terephthalate, polybutylene terephthalate, polytetrafluoroethylene, terephthalate, polyacryloactone, polylactic, polyhydroxybutyrate, polyhydroxyvalerate, polyethylene adipate, polybutylene adipate, polypropylene succinate, polyethylene glycol, polybutylene glycol, polypropylene oxide, poloxymethylene, polytetramethylenene ether, polytetrahydrofuran, polyepichlorohydrin, urea-formaldehyde, melamine-formaldehyde, phenol formaldehyde, polyethylene, polypropylene, polybutylene, polybutene, polycyclo, polyphenylene oxide, polyethylene sulfide, polyether sulfone, polyphenylene ether sulfone, polydimethyl siloxane, polycarbonyle silane, polyvinyl butyral, polyvinyl alcohol, esters and ethers of polyvinyl alcohol, polyvinyl acetate, polystyrene, polyethylene, polyvinyl chloride, polyvinyl pyrrolidone, polyvinyl methyl ether, polyethylene vinyl ether, polyvinyl methyl ketone, polyethylene-co-vinyl acetate, polyethylene-co-acrylic acid, polybutylene terephthalate-co-polyethylene terephthalate, and polylaurilactam-block-poloytetrahydrofuran. The core yarn can also comprise natural fibers (such as cotton, linen, jute, hemp, cotton, wool, and wood pulp); regenerated cellulose fibers (such as viscose rayon and cuprammonium rayon); and modified cellulose fibers (such as cellulose acetate). In one particular embodiment, the core yarn comprises polyolefins, such as polypropylene.

The material used in preparing the core yarn can be chosen based on intrinsic factors apart from melting temperature alone. For example, a core yarn material can be chosen based upon the dyeability of the material so that the end product chenille can have the desired properties. The pile or effect yarns can likewise be chosen based upon such considerations.

The chenille core yarns preferably have an overall size commensurate with conventional chenille yarns. In certain embodiments, the core yarns are in the range of about 100 denier to about 900 denier, preferably about 100 denier to about 800 denier, more preferably about 100 denier to about 600 denier. Each core yarn can also comprises a plurality of individual filaments. In certain embodiments, the core yarn can comprise between 2 filaments and about 250 filaments, preferably about 4 filaments to about 200 filaments, more preferably about 8 filaments to about 150 filaments, and more preferably about 10 filaments to about 100 filaments. Each filament is preferably less than about 20 denier, more preferably less than about 15 denier, even more preferably less than about 10 denier, and most preferably less than about 5 denier. Of course, in embodiments where the core yarn comprises a single filament, the single filament would be expected to be of greater size, such as about 20 denier to about 100 denier.

Suitable pile or effect yarns for use in the chenille yarns of the present invention include, but are not limited to the following: natural fibers, such as cotton, linen, jute, hemp, cotton, wool, and wood pulp; regenerated cellulose fibers such as viscose rayon and cuprammonium rayon; modified cellulose fibers, such as cellulose acetate; and synthetic fibers such as those described above in relation to the core yarn, especially those derived from polypropylene, polyethylene, polyvinyl alcohol, polyesters, polyamides, and polyacrylates. The above-mentioned pile or effect yarns may be used alone or in combination with one another. Multicomponent fibers comprising a blend of one or more of the above materials may also be used if so desired. Desirably, the pile or effect yarn comprises cotton, wool or acrylic yarns, alone or in combination with one another.

The adhesive component of the inventive chenille yarns can comprise any adhesive capable of forming a chenille yarn meeting the performance standards described herein. Particularly, the adhesive should be capable of providing abrasion resistance within the performance ranges described above. Preferably, the adhesive component is “activatable” or subject to “activation” by external means. In other words, the adhesive should comprise a compound having at least one physical or chemical property such that upon application of activation means (e.g., heat, radiation, etc.), the compound transitions to a state where it can effect adhesion of the remaining components of the chenille yarn. Thus, a step of activating an adhesive can mean subjecting the adhesive compound to conditions such that the compound is formed into a state effective for facilitating adhesion.

The adhesives of the invention are particularly useful in achieving the surprising performance characteristics described herein. Previous attempts to incorporate an adhesive into yarns have faced the difficulty of balancing bonding strength with the risk of stiffening the yarns and fabrics prepared with the yarns. In other words, it has not heretofore been known how to adhesively secure effect yarns in a chenille yarn in a manner that maximizes the strength (and, therefore, abrasion resistance) of the yarns, and fabrics prepared with the yarns, without sacrificing the desirable qualities of the chenille (e.g., softness, velvety texture, etc.). According to the present invention, the specific compounds and combinations of compounds comprising the adhesive component of the chenille yarn are able to achieve optimal bonding without sacrificing any of the desired “feel” characteristics of chenille. In particular, the adhesives of the invention have flow characteristics that allow for optimum bonding without fear of “stiffening” of the overall chenille product. More particularly, in specific embodiments, the present invention provides a dual-mode adhesive that specifically relies on a combination of at least two compounds to achieve this goal. Such combinations are described below.

In one preferred embodiment, an adhesive useful according to the invention can be formed of a specific blend of polymers. Such polymer blends are particularly useful in light of their desirable yet contradictory properties. For example, the polymer blends can exhibit wet out properties while also providing desirable blocking resistance (or anti-blocking) and durability properties as well.
The properties of a polymer blend typically are not simply a linear mixture of those of the constituent polymers, but rather the blend properties that result are often inferior to that of a linear prediction. For example, modifying the melt viscosity of a polymer used in the production of hot melt adhesives by blending with another polymer to reduce tackiness can negatively impact the desired flow of the resultant product and render is useless for its intended application. Conversely, blending a high melt strength polymer with another polymer to improve flow properties can similarly result in a product that no longer useful for its intended purpose.

The polymer blends useful according to the present invention can substantially or completely wet out a surface at a given activating temperature without requiring the application of substantial or any pressure. Stated differently, the polymer blends of the invention are readily flowable under activating temperature conditions without requiring the concurrent application of pressure to promote or facilitate polymer flow. Yet, despite the ready flow or wetting properties of the polymer blends of the invention, in contrast to conventional flowable polymers, the polymer blends do not exhibit substantial blocking problems.

Wetting out of a surface often requires the application of pressure to evenly distribute an adhesive material. In exemplary embodiments of the present invention, though, the polymer blend can substantially wet out a surface to which is has been applied without requiring the application of substantial pressure or completely without the application of pressure. As used herein, the absence of "substantial pressure" refers to the application of pressure beyond pressure associated with concomitant processing conditions. In relation to the formation of chenille yarns, it is preferable that wetting out can occur without addition of any external pressure on the yarn.

In exemplary embodiments of the invention, the polymer blend can substantially or completely wet out the surface in about one hour or less, and can be applied in as little as a few minutes (for example, about two minutes or less) at a selected activating temperature. Wetting out of a substrate surface generally refers to contact angles of less than about 90 degrees, or less than about 135 degrees.

An activating temperature according to the invention is intended to refer to the temperature at which the adhesive component transitions from a stable, non-flowable state (i.e., the solid form) into a flowable state (e.g., a melt or a liquid), and may be referred to as the flow activating temperature. The flow activating temperature for the polymer blends can vary depending on various factors. Preferably, the polymer blends of the invention have an activating temperature of less than about 200°C, less than about 175°C, less than about 150°C, less than about 125°C, less than about 100°C, or less than about 75°C. In specific embodiments, the flow activating temperature ranges from about 75°C to about 175°C, or from about 100°C to about 150°C, although polymer blends exhibiting substantial wetting properties at activating temperatures outside of this range can also be useful. The term activating temperature as used herein refers to the temperature at which the polymer blend will flow and does not necessarily refer to the temperature of an oven, bath, or other heating device through which an article to which the polymer blend is applied may be passing.

Polymer blends of the invention can be made to conform to certain processing conditions, such as the activating temperature. In a specific embodiment, the polymer blend can exhibit a flow activating temperature of about 100°C. Such systems can be designed to exhibit very high flow in conditions typical to water evaporation or steam generation, such as passing a substrate through a low temperature drying oven (i.e., enough heat to drive off water), or exposing the substrate to high temperature water or steam (e.g., in dye baths, etc.). The onset of softening can be well above 55°C so that the flow transition can be sharp to avoid tackiness and blocking. Thus, even in embodiments where the activating temperature is around 100°C, the polymer blend is not tacky and does not block above about 55°C.

In other embodiments of the invention, the polymer blend can exhibit a flow activating temperature of about 125°C. Such systems can be substantially inert at boiling water temperatures yet can flow well in higher temperature conditions, such as an autoclave. Such systems can likewise be suited for powder delivery to a substrate in applications for which stability in hot water, such as in washing, is advantageous or required.

In further embodiments, the polymer blend can have an activating temperature of about 150°C. Such systems have higher melt strengths and accordingly can be more readily melt spun to form a fibrous article, such as a component of a multicomponent fiber or filament (for example, a sheath component of a bicomponent sheath core fiber). The resultant higher viscosity exhibited by such polymer blends can result in longer penetration times at temperatures of less than 150°C (for example about 125°C), but viscosity can decrease at increasing temperatures, including temperatures approaching 150°C, and/or using finer dispersions of the solid binder and/or more penetrating radiant energy for faster heat-up. Such systems can be suited for delivery via bicomponent fibers introduced into a substrate, for example, by blending the bicomponent fibers with other fibers.

As used herein, the term "blocking" refers to the "stickiness" or "tackiness" that polymer products can exhibit when exposed, either in the raw material state or after activation and resolidification, to elevated temperatures and/or other environmental conditions (such as humidity), during processing, storage, and/or transportation. Blocking can be particularly problematic in the storage and/or transportation of products formed of readily flowable polymers that
are subjected to extremes in ambient temperature, humidity, and other conditions that can result in undesired adhesion of the products to one another, or to other objects. Blocking is a problem encountered in many adhesive polymer applications and often requires the inclusion of “anti-blocking” additives.

In contrast to many conventional flowable polymers, the polymer blends useful in the invention exhibit block resistant (or anti-blocking) properties without requiring the addition of substantial amounts of anti-blocking agents. Thus, the polymer blends are not susceptible to developing a tacky or sticky feel when cooled from elevated temperatures, such as those used in polymer processing or when packages or rolls are exposed to expected extremes of temperature, humidity, and other environmental conditions to which a polymer product can be exposed during transportation and storage.

Blocking can be evaluated using procedures known in the art. For example, pellets or powder can be layered several deep in an aluminum pan, which is then placed in a convection oven at a specified time for a specified temperature. Test conditions, such as time, temperature, humidity, and the like, employed in analyzing blocking properties, can be based on anticipated field use conditions that will be experienced. The pellets are then removed from the oven and cooled. If the pellets adhere to one another at all, they are judged to fail by “blocking.” Weight may be applied and blocking may appear only at the bottom of a container. Long storage times and potential humidity effects may also increase actual blocking behavior.

Polymer blends used as an adhesive component in the present invention preferably comprise two or more different components, wherein at least two of the components include one or more polymers or other compounds that differ from one another with respect to their molecular weights. The polymer blends can comprise at least a first blend component and a second blend component. Preferably, the first blend component comprises one or more polymers having a first molecular weight, and the second blend component comprises one or more compounds (which may or may not be polymeric in nature) having a second molecular weight that is less than the molecular weight of the polymer of the first blend component. The respective blend components can also be referred to as the higher molecular weight polymer component and the lower molecular weight component. In exemplary embodiments, the higher molecular weight blend component can include at least one or more polymers having a molecular weight that is at least about three times higher than the molecular weight of at least one or more compounds of the lower molecular weight blend component. In further embodiments, the higher molecular weight blend component can include at least one or more polymers having a molecular weight that is up to about five times higher than the molecular weight of at least one or more compounds of the lower molecular weight blend component.

Although not wishing to be bound by any theory, it is believed that the blends take advantage of the fact that melt strength and melt viscosity follow different functions of polymer molecular weight distribution. The combinations of high and low molecular materials useful in the invention can exhibit high melt strength or elasticity as compared to the viscosity or resistance to flow also exhibited by the blend. The resultant blends can flow well yet can also be strong and can be spun into fibers.

In specific embodiments the molecular weight of the polymers of the higher molecular weight blend component is such to prevent the first blend component from substantially wetting out a surface without the application of substantial pressure under the same temperature conditions (i.e., flow activating temperature) under which the overall polymer blend will substantially wet out the surface, as discussed above. The higher molecular weight polymer(s) can have a number average molecular weight ranging from greater than about 6,000 to about 50,000. In specific embodiments, polymers having even higher molecular weights can be used. In certain embodiments, the number average molecular weight is from about 18,000 to about 30,000. The higher molecular weight polymer component can be useful in imparting desired melt strength to the polymer blends.

All molecular weights provided herein are provided as number average molecular weight unless otherwise noted. Number average molecular weight ($M_n$) can be calculated according to the following formula

$$M_n = \frac{\sum N_i M_i}{\sum N_i}$$

wherein $N_i$ is the number of polymer molecules (or the number of moles of those molecules) having molecular weight $M_i$.

In various embodiments, the polymer(s) of the higher molecular weight blend component are selected to have a molecular weight that is sufficiently high to impart sufficient melt strength to the blend to permit processing of the polymer blend, such as to permit melt spinning or quenching the polymer blend. Thus, it is possible to form a desired product, such as a fiber or fibrous structure, including a component of a multicomponent fiber, as described herein. Melt strength is commonly measured by die-swell when a polymer is extruded from a capillary. The practical manifestation is that molten streams in a spin cabinet can be pulled without breaking, elongating to form individual fibers.

The molecular weight of the one or more compounds of the lower molecular weight component can be selected to be sufficiently low so that the second blend component exhibits a level of molecular mobility sufficiently high so as to limit its usefulness for the production of an article such as a fiber or fabric when processed alone and without combination with another component. The one or more compounds and/or the second blend component may, for example, exhibit too much molecular mobility so that its usefulness alone is limited because it may be susceptible to blocking, and/or because it may exhibit too much creep, and/or it may have inadequate melt strength to be processed. In various exemplary embodiments of the invention, the one or more compounds of the lower molecular weight blend component can have a molecular weight of about 6,000 or less. In certain embodiments, the molecular weight is greater than 0 to about 6,000 or greater than about
preferably, the one or more compounds of the lower molecular weight blend component (without combination with another component) cannot be spun onto a package without blocking, using normal commercial fiber spinning operations.

[0104] Creep or cold flow of a polymer blend can be evaluated using an accelerated test as follows. Pellets are loaded into a capillary rheometer such as used for melt flow testing, and a specified weight is applied (e.g. the standard 2.16 kg). The temperature is then ramped up in gradual steps until the weighted piston begins to compress the pellets. The temperature at which this happens is noted. Cold flow can also be checked at ambient temperatures periodically, (e.g., 30 days or 60 days).

[0105] In addition to the relative molecular weights of the components of the blend, the blend components, and one or more of the constituent polymers and/or compounds thereof, can also differ with regard to melt flow rate (MFR), also as determined using conventional test standards, such as ASTM method D 1238B. In specific embodiments, the higher molecular weight polymer component, and/or one or more of its constituent polymer(s), can have a melt flow rate less than the melt flow rate of the lower molecular weight component, and/or one or more of its constituent compound(s). Stated differently, the lower molecular weight component (and/or one or more of its constituent polymers) of the polymer blend can have a relatively high MFR as compared to the MFR of the higher molecular weight polymer component (and/or one or more of its constituent compounds).

[0106] As non-limiting examples, the lower molecular weight component (and/or one or more of its constituent compounds) can have a melt flow rate that is at least about five times, or at least about ten times, higher than the melt flow rate of the higher molecular weight polymer component (and/or one or more of its constituent polymers). In other embodiments, the higher molecular weight polymer component (and/or one or more of its constituent polymers) can have a melt flow rate of about 1 decigrams per minute at a temperature of about 125°C as determined in accordance with ASTM method D 1238B, and the lower molecular weight component (and/or one or more of its constituent compounds) can have a melt flow rate of about 100 decigrams per minute at a temperature of about 125°C.

[0107] The components, and/or one or more of the constituent polymers and/or compounds thereof, of the blends of the invention can also differ from one another with regard to melting point, as determined using conventional test standards, such as differential scanning calorimetry (DSC). In certain embodiments, the higher molecular weight polymer component (and/or one or more of its constituent polymers) can have a melting point that is higher than the melting point of the lower molecular weight component (and/or one or more of its constituent compounds). Thus, the lower molecular weight component (and/or one or more of its constituent compounds) of the polymer blend can have a relatively low melting point as compared to the melting point of the higher molecular weight polymer component (and/or one or more of its constituent polymers). In specific embodiments, the higher molecular weight polymer component (and/or one or more of its constituent polymers) can have a melting point of at least about 10°C, at least about 20°C, or at least about 50°C, higher than the melting point of the lower molecular weight component (and/or one or more of its constituent compounds).

[0108] The melting point of the uniform polymer blend itself can also vary, depending on various factors. In exemplary embodiments, the melting point of the polymer blend can be within about 20°C of the targeted blend application temperature (i.e., the activating temperature). The polymer blends exhibit the desired flow properties described herein despite the presence of the higher molecular weight component, which typically does not flow until exposed to an “activating” temperature of at least about 50°C, or more above its melting point. Suitable polymer components useful for providing a polymer blend with a melt temperature as described herein can include substantially crystalline polymers, as discussed in more detail below.

[0109] The molecular weight ranges of the blend components can vary depending on a particular application or use of the blend and can be readily determined by the skilled artisan. In various embodiments, the blends can be of similar portions of two materials with fairly extreme differences in flow (due to crystallinity and/or molecular weight) yet are compatible and provide synergistic properties in the blend. Such synergies can be exhibited by sufficient melt strength/viscosity for fiber formation and/or by a low/such sharp profile effect as discussed herein.

[0110] The polymer components of the polymer blends can include any of the types of polymers suitable for the formation of a particular article, i.e., can be any of the types of polymer resins known in the art capable of being formed into article such as fibrous materials (including without limitation fibers, filaments, yarns, nonwoven articles, and the like, as discussed herein). Particular examples of polymers forming the blends useful according to the present invention include without limitation polyolefins, including polypropylene, polyethylene, polybutene, and poly(methyl pentene); polyamides, including nylon 6 and nylon 6,6; polyesters, including polyethylene terephthalate (PET), polyethylene naphthalate (PEN), polytrimethylene terephthalate (PPT), poly(1,4-cyclohexylene dimethylene terephthalate) (PCT), glycol-modified polyethylene terephthalate (PETG), and aliphatic polyesters such as polyactic acid (PLA); acrylics; thermoplastic elastomers; polycrylonitrile; acetics; fluoropolymers; epoxies; phenoxies; vinyl alcohol polymers; polystyrene; polyhydroxyalkanoates (PHA); polysulfone; polyetheretherketone; cellulose acetate and rayons; polyurethanes; hot melt adhesives; and the like, as well as copolymers, terpolymers, and ionomers of these and other suitable polymers, and combinations thereof. Polyolefins can be particularly advantageous in various embodiments. Bio-based polymers which can be biodegradable made from PLA and PHA can also be useful in various embodiments.

[0111] Hot melt adhesives can particularly be useful in various embodiments. Hot melt adhesives are typically thermoplastic polymers that are solid at room temperature and liquid at elevated temperatures, for example, solid at temperatures below 180°F and low viscosity fluids above 180°F. Hot melt adhesives set to a bond on cooling. Hot melt adhesives can include without limitation paraffins, waxes, polyolefins, polyvinyl acetate polyamides, ethylene vinyl acetate (EVA) copolymers, styreneisoprene-styrene
(SIS) copolymers; styrene-butadiene-styrene (SBS) copolymers; ethylene ethyl acrylate copolymers (EEA); polyurethane reactive (PUR), and the like, and combinations thereof.

0112 Thermoplastic elastomers as known in the art can also be useful in various embodiments. Exemplary elastomers include without limitation polyurethane elastomeric materials; polyamide elastomeric materials; polyester elastomers; polyetherester elastomeric; polyetheramide elastomeric materials; polyolefin elastomers; elastomeric styrene block copolymers, including diblock and triblock copolymers based on polystyrene (S) and unsaturated or fully hydrogenated rubber blocks, which can consist of butadiene (B), isoprene (I), or the hydrogenated version, ethylene-butylene (EB) and the like and combinations thereof.

0113 Functionalized polymers can also be useful as one or more of the components of the blends. The functionality can be selected to provide a desired thermodynamic attractive force between the polymer blend and the target substrate to which the blend is applied, such as a natural fiber. This in turn can improve wet out of the polymer blend.

0114 The polymers can be functionalized as known in the art to impart a desired property thereto, such as a functional group to improve wet out and/or adhesion properties of the polymer component and/or the resultant polymer blend. Exemplary functionally modified polymers useful in various embodiments can include, for example, various functionalized polyolefins, such as but not limited to olefins modified by reaction with at least one unsaturated anhydride, unsaturated acid or unsaturated ester. As a non-limiting example, useful functionalized polyolefins can include an olefin modified by reaction with at least one unsaturated anhydride, unsaturated acid or unsaturated ester selected from the group consisting of maleic anhydride, citraconic anhydride, itaconic anhydride, glutaric anhydride, 2,3-dimethylmaleic anhydride, maleic acid, fumaric acid, citraconic acid, itaconic acid, mesaconic acid, glutaric acid, acrylic acid, methacrylic acid, crotonic acid, 2-pentenoic acid, 2-methyl-2-pentenoic acid, dimethyl maleate, diethyl maleate, di-n-propyl maleate, diisopropyl maleate, dimethyl fumarate, diethyl fumarate, di-n-propyl fumarate, di-isopropyl maleate, dimethyl itaconate, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, methyl crotonate, and ethyl crotonate. Polymer blends including one or more maleic anhydride modified olefins, including without limitation maleic anhydride modified polypolyethylene and maleic anhydride polyethylene, can be particularly useful in various applications. Some of these functionalities can also be created by oxidizing an olefin, and other exemplary polymers include polymers functionalized by oxidizing the polymer, for example, by oxidizing a polyolefin.

0115 Non-limiting examples of functionalized polymers useful herein include maleated polyethylene commercially available from Dow Chemical and maleated waxes such as the EPOLENE® waxes commercially available from Eastman Chemical Company. Also useful are polymeric or on-polymeric compounds having one or more carboxyl, hydroxyl, and/or amine functional groups. In this embodiment, the lower molecular weight component can include one or more substantially crystalline or semicrystalline functionalized compounds, which can also be lower molecular weight compounds that have a melting point that is higher than the glass transition temperature (Tg) of at least one polymer of the higher molecular weight components of the blend. Although not wishing to be bound by theory, it is currently believed that the increased functionality imparted to the blends by incorporating such functionalized polymers can increase wet-out and improve adhesion to cellulosics, cotton, and other natural fibers, as well as synthetic fibers spun from acrylic, nylon, and other polar polymers.

0116 The functionalized additive can act as an “activating agent” to promote adhesion of the yarn and can be selected based at least in part upon the nature of an adhesive to be used with the yarn. The functionalized additive can be incorporated into the polymer (e.g., a polyolefin or polyester) using any suitable technique, such as blending fiber formed of the functionalized additive with the yarn, coating the yarn with the functionalized additive, and/or incorporating the functionalized additive as a component in a multicomponent fiber. The functionalized additive can be incorporated into other synthetic polymers, such polymides and modified cellulosics.

0117 A non-limiting example of an activatable yarn includes a polyolefin or a polyester yarn having a maleic anhydride modified polyolefin incorporated therein. Activation of the maleic anhydride modified polyolefin can promote bonding of the polyolefin and/or polyester yarn using a nylon-based adhesive. Another non-limiting example of an activatable yarn includes a polyolefin or polyester yarn having an amine functionalized additive, such as stearamide, incorporated therein as the functionalizing additive. Activation of the stearamide can promote bonding of the yarn using an acid functional binder.

0118 At least one or more of the components of the polymer blends of the invention can include a substantially crystalline or semicrystalline polymer. Various embodiments of the invention can include, for example, at least one or more substantially crystalline low molecular weight polymer component(s). The term “substantially crystalline or semicrystalline” is understood in the polymer art and as used herein refers to a material’s inherent ability to crystallize when referring to material type, or alternatively its current state of crystallinity when referring to a particular product or object, as determined using conventional techniques as known in the art. Methods for determining the degree of crystallinity of a polymer are known in the art and include, for example, DSC, density gradient tubes, and x-ray diffraction techniques. Generally as used herein, the term crystalline or semicrystalline refers to materials having a melt peak on DSC with at least about 5 J/g of material, or more, for example, at least about 10 J/g material or more. As non-limiting examples, polyesters can exhibit a melt peak on DSC of about 30 to about 50 J/g and olefins can exhibit a melt peak on DSC of up to about 100 J/g.

0119 The addition of a substantially crystalline polymer component, including a low molecular weight substantially crystalline polymer component, can promote the flow of the polymer blend at low temperatures without blocking or fusing. The addition of one or more substantially crystalline low molecular weight polymers can, for example, result in a blend having a melting point within about 20° C. of the targeted blend application temperature (i.e., the activating temperature, which can be, for example, about 125° C. or less).
In specific embodiments, the low molecular weight component includes a substantially crystalline polymeric or non-polymeric component (also referred to herein as a substantially crystalline plasticizer). In such embodiments, the substantially crystalline low molecular weight component can have a melting temperature (Tm) that is higher than the glass transition temperature (Tg) of the higher molecular weight polymer component of the blend. Again, although not wishing to be bound by theory, it is believed that the use of such materials in the blend can result in sharp flow profiles. The polymer blend of this embodiment can be in any of the various forms discussed herein, including fibers, nonwoven fabrics, coatings, and the like. An exemplary blend in accordance with this embodiment of the invention can include phenoxy compound having a specific Tg (e.g., as the high molecular weight component) and a substantially crystalline component (e.g., a plasticizer) having a Tm that is higher than the Tg of the phenoxy component.

Each of the components can be present in the polymer blend in an amount sufficient to impart the desired wetting and blocking resistance properties thereto. In exemplary embodiments of the invention, the blend can include at least about 10 percent by weight of one, or both, of the higher molecular weight and the lower molecular weight components. In further embodiments, the polymer blends of the invention can include at least about 20 percent by weight, at least about 30 percent by weight, at least about 40 percent by weight, and at least about 45 percent by weight, based on the total weight of the polymer blend, of one or both of the higher and lower molecular weight components.

The respective first and second components of the polymer blends of the invention can include at least one, or a blend of more than one, component thereof. For example, the first component of the polymer blend can include at least about 10 weight percent of one polymer or can include at least about 10 weight percent of a blend of two or more polymers (in which case, the first blend component can comprise less than 10 weight percent of a particular polymer of the polymer blend). Similarly, the second component of the polymer blend can include at least about 10 weight percent of one compound or can include at least about 10 weight percent of a blend of two or more such compounds (in which case, the second blend component can include less than 10 weight percent of a particular compound or component thereof). The compound of the second blend component can include polymeric and non-polymeric compounds.

In embodiments including a blend of polymers as the first blend component, one or more of the polymers can meet one or more of the criteria of molecular weight, Tg, etc., as discussed herein. Similarly, in embodiments including a blend of compounds as the second blend component, one or more of the compounds can meet one or more of the criteria of molecular weight, Tm, etc., as discussed herein.

The polymer components, and additives when present, can be present in amounts outside of these ranges as well. Relatively high amounts (e.g., at least about 10 percent by weight, or up to about 50 percent by weight) of the low molecular weight component (which can have a melt flow rate in the thousands) can be included in the polymer blends without substantially decreasing the blocking resistance of the polymer blend and also without significantly decreasing the processability of the polymer blend. Similarly, the polymer blends can include relatively high amounts (e.g., at least about 10 percent by weight) of the high molecular weight polymer component without significantly reducing the flow or wetting properties of the blend as described herein.

The polymer components can be blended with one another using conventional mixing techniques. In exemplary embodiments, the polymer components can be dry blended with one another prior to melting the polymers in subsequent extrusion or other polymer processing steps. In other exemplary embodiments, separate polymer melts can be combined with one another, for example, as polymer melts pass through an extruder.

In other embodiments, the polymer blend can further include at least one additive, as discussed herein, in a ratio of about 1:1:1 (read as the ratio of the high molecular weight polymer component to the low molecular weight component to the additive). As discussed herein, though, additives (when present) can be present in amounts outside of this ratio.

Exemplary additives useful in the present invention can include without limitation metallic particles, antimicrobials, biocides, flame retardants, toxic absorbers, conductive agents, abrasives, antioxidants, UV stabilizers, optically active compounds, tracers, plating catalysts, particulates, reinforcing agents, fillers, pigments, talc, glass fibers, clays, silicas, mineral silicates, mica, odor absorbers, nano-particles, chemical deactivators such as activated carbon, anti-stats, markers, counterfeit tracers, fluorescents, fungicides, mildewcides, phosphorescents, reflectants, “smart fabric” components, polytetrafluoroethylene (PTFE), repellants, ointments, and the like, and combinations thereof. The polymer blends allow for ready application of a wide ranging amounts of additives and can be particularly useful in the application of very low amounts of additives. The blends can be useful for applying a very small amount of additive substantially uniformly to a substrate with durability. The resultant layer can in many instances be just a few microns thick as well so that the particle size of the additive can be very small. This can be useful in many applications in which the additive particles might otherwise be buried below the skin of a synthetic fiber.

The polymer blends have the additional benefit of having inherently low color. This masks surface imperfections of a substrate to which the polymer blend is applied, which in turn can reduce dullness and create a “wetter,” silkier look.

Additives can be incorporated into the polymer blends using conventional techniques. The additive(s) can independently blended with one or more of the polymer components and/or can be added to the polymer blend. In exemplary embodiments, the additive(s) can be dry blended with one or more of the polymer components of, and/or with the polymer blend itself, prior to melting the polymer components and/or the resultant polymer blend in subsequent extrusion or other polymer processing steps. The additive(s) can also be added to melts of the polymer components and/or of the polymer blend, for example, as the polymer component and/or polymer blend melt(s) pass through an extruder. A masterbatch of one or more polymer components and/or the polymer blend and the additive(s) can also be prepared and added to the polymer components.
and/or polymer blend in dry or melt form. The additive(s) can be used in the invention in various forms, including powder, liquid and melt forms, as appropriate for a given application.

[0130] The polymer blends can be suited for uniformly dispersing and binding particulate additives to a substrate, durably anchoring the additive to the substrate, for example via a thin flexible coating, to optimize placement and maximize performance. As noted herein, the polymer compositions of the invention can have sharp flow profiles with improved flow at lower temperatures for bonding. Yet, the polymer blends are not tacky or prone to block at normal extremes of temperature exposure during transporting and warehousing. The polymer blends can be used to deliver discontinuous deposits (for example small islands) or a substantially continuous yet breathable network that coats and bridges the surface layer of the substrate (such as the surface of fibers) in a construction. In addition, the polymer blend additive systems can exhibit the permanence of a thermoplastic but can be applied to a substrate at very low levels with good penetration and dispersion.

[0131] While the foregoing describes a blend of polymers that together function as an adhesive component, the present invention also encompasses a variety of other types of adhesive components. For example, in certain embodiments, the adhesive can comprise a single polymeric material that itself is capable of functioning as an adhesive.

[0132] In one embodiment, the adhesive component of the chenille yarn comprises a maleic anhydride-grafted polymer, particularly polyolefins, such as polypropylene. Polyolefins grafted with anhydrides, including maleic anhydride, have been used previously as film laminates. The present invention has realized the ability of such materials for use as an adhesive component in a chenille yarn. Any maleic anhydride-grafted polymer having physical characteristics as described herein useful as an adhesive component can be used in the invention. For example, U.S. Pat. No. 6,380,320 (which is incorporated herein by reference) describes anhydride-grafted polymers and methods of preparing such polymers. One specific example of such a polymer is AMPLIFIED™ GR 209 (available from Dow Plastics), which is a maleic anhydride grafted (MAH) polymer based on an ethylene-butene copolymer, exhibits high flexibility and elasticity, can be utilized in monolayer and coextruded films, and to enhance interlayer adhesion.

[0133] Other commercially available maleic-anhydride-functional polyolefins are also useful as adhesives according to the present invention. Such further adhesives include the entire EPOLENE® series of polymers and polymer grades, including the “E” series, available from Eastman Chemical Co., and the “C” series, available from Westlake Chemical Co.

[0134] In other embodiments, the adhesive component of the chenille yarn comprises a polyethylene oxide polymer. Polyethylene oxide (PEO) is a semi-crystalline polymer that typically must be heated above its melting temperature while in contact with a substrate to allow entanglement of chains and subsequent crystallization upon cooling. The overall adhesive strength of the interface can be dependent on the thickness of the PEO layer. Any polyethylene oxide compound having physical characteristics as described herein useful as an adhesive component can be used in the invention, including combinations of PEO with other compounds. For example, a wax product containing polyethylene oxide, such as CARBOWAX® PEG-1450 (available from Dow Chemical) could be used as an adhesive component. SENTRY® type polyethylene glycol polymers are further, non-limiting examples of polymers that can be used according to the invention.

[0135] Further to the above, the adhesive component of the invention can comprise a variety of polar, low-melt thermoplastics. A low-melt thermoplastic encompasses any material typically recognized has being thermoplastic in nature that also has a melting point below the melting point of the lowest melting component of the core yarns. Preferably, the low-melt thermoplastic has a melting point at least 5°C, at least 10°C, or at least 20°C below the melting point of the lowest melting component of the core yarns. As used herein, a “low-melting thermoplastic polymer” is a thermoplastic polymer having a melting temperature of less than 180°C. Thermoplastic polymers are typically long chain polymer that can be either amorphous in structure or semi-crystalline. These polymers are long chain, medium to high molecular weight materials, whose general properties are those of toughness, resistance to chemical attack, and recyclability. Examples of materials useful as low-melt thermoplastics in the invention include polyesters, such as polyethylene terephthalate and polybutylene terephthalate, and polyamides. Examples of other polar polymers useful as an adhesive according to the invention include polyvinylidene fluoride and polyactic acid, as well as, importantly, copolyesters and copolyamides. Such polar thermoplastics can exhibit improved adhesion to polar surfaces over non-polar melt-adhesives, such as polyolefins. The polarity of these polymers also improves wetting on other polar surfaces.

[0136] In a specific embodiment, the invention provides a chenille yarn including a core yarn comprising a sheath/core multicomponent fiber, wherein the sheath comprises an adhesive component as described herein. In specific embodiments, the core component of the multicomponent fiber comprises a polyolefin, preferentially polypropylene. In such embodiments, the sheath can comprise any material capable of functioning as an adhesive as described herein. Particularly, the sheath component has a melting point below the melting point of the core component. Preferably, the adhesive is capable of imparting the physical characteristics, such as abrasion resistance, described herein. In one embodiment, the sheath comprises a maleated polyolefin.

[0137] In further embodiments, the chenille yarn can comprise two or more core yarns, wherein one or more of the core yarns comprises a sheath/core multicomponent fiber, as described above. In preferred embodiments, both core yarns comprise such a multicomponent yarn. Each core yarn may comprise a plurality of fibers, wherein one or more of the fibers is a multicomponent fiber. Accordingly, one or more of the fibers making up the core yarn can be formed without an adhesive component applied thereto (e.g., an uncoupled polypropylene homopolymer fiber). Of course, the core yarns can be formed of any combination of core yarns, effect yarns, and adhesives described herein useful to prepare a chenille yarn having the physical characteristics described above.

[0138] In another aspect, the invention also provides a method of preparing chenille yarns as described herein. In
one embodiment of the present invention, a chenille yarn is produced by a process wherein at least one core yarn is fed into a chenille machine. The at least one core yarn can comprise a multicomponent fiber having an adhesive component as the sheath of a sheath/core or islands-in-the-sea fiber or as an exposed surface of a segmented fiber. Alternatively, the adhesive component can be coated onto the core yarn. Preferably, at least two core yarns are fed into the chenille yarn, and at least one of the core yarns is as described immediately above. If three or more core yarns are provided, at least one core yarn can comprise the adhesive component and the remaining core yarns can be free of the adhesive component or be as immediately described above. Desirably, the adhesive component included in the core yarn has a softening or melting point of at least 10°C lower than the remaining components of the core yarn.

[0139] A number of chenille machines are well known to those of ordinary skill in the art and may be used to prepare the chenille yarn of the present invention. Suitable chenille machines include, but are not limited to, those disclosed in U.S. Pat. No. 3,869,850 issued to Gross; U.S. Pat. No. 3,969,881 issued to Boldrini; and U.S. Pat. No. 5,259,178 issued to Sostegni.

[0140] The chenille yarn exiting the chenille machine includes the effect yarn and can be subsequently treated to activate the adhesive component and form a pre-bonded yarn wherein the pile or effect yarn is securely attached to the core of the chenille yarn. Alternatively, the non-bonded chenille yarn can be fed directly to suitable equipment for forming woven or knit fabrics. The formed fabric can then be subjected to treatment to activate the adhesive component and form a bonded fabric. In further embodiments, the chenille yarn (either pre-bonded or non-bonded) can be wound onto one or more cones for storage prior to fabric formation.

[0141] One method of producing the chenille yarns of the present invention is schematically described in FIG. 11. Referring to FIG. 11, a first core yarn 105 and a second core yarn 107 are fed into a chenille machine 115. At least one of the first and second core yarns preferably comprise the adhesive component, such as comprising a multicomponent fiber with the adhesive component present at the surface of the fiber or as a coating one or both of the core yarns (105, 107). As the chenille yarn 100 exits the chenille machine 115, the chenille yarn 100 is taken up on a bobbin 120 and subsequently transferred onto a storage cone 125. In alternate embodiments, the bobbin can be omitted and the chenille yarn can be transferred directly onto storage cones. In such embodiments, it is preferable to include one or more intermediate rollers for properly tensioning the yarn. The chenille yarn can be stored for later use in the preparation of chenille fabrics or other products.

[0142] In another embodiment, illustrated schematically in FIG. 12, the process comprises all of the same steps as described above. However, in this embodiment, the process includes a step for continuously bonding the chenille core. In particular, the method incorporates an adhesive activation chamber 130 either upstream or downstream of the bobbin (if present). Preferably, the chenille yarn 100 is fed under tension through adhesive activation chamber 130 to activate the adhesive component of the core yarn(s) (105, 107). For example, the adhesive activation chamber 130 can comprise a continuous autoclave or other type of heat unit capable of activating the adhesive component, such as by heating above the melting temperature of the adhesive component (e.g., by steam, electric lamps, or gas burners). In certain embodiments, the adhesive activation chamber 130 can comprise an apparatus generating radiation of a wavelength effective to activate the adhesive. For example, an apparatus generating radiation in the microwave range could be used. In such embodiments, the adhesive component of the chenille yarn can include additives that effect activation in response to the application of the radiation, such as metal particles (which can cause the adhesive to increase in temperature upon application of the microwave radiation. More particularly, upon application of microwave radiation, the metal particles can become heated and activate the surrounding adhesive component (such as causing melting of the adhesive component). Thus, the invention comprises activating the adhesive component by applying microwave radiation.

[0143] The adhesive activation chamber 130 can optionally comprises a separate cooling chamber 140. In this way, the present invention allows for the preparation of a pre-bonded or pre-heat-set chenille yarn that can be used in more vigorous yarn applications, such as certain high energy methods, described below, for forming fabrics. Known methods of forming adhesive chenille fabrics typically require forming the fabric and then adhering the components.

[0144] The adhesive activation chamber 130 can have dimensions (height and width) such that multiple chenille yarns may enter at the upstream end 132 of the adhesive activation chamber 130. The length of the adhesive activation chamber 130 may vary as long as the chenille yarn is subjected to a sufficient amount of heat to activate the adhesive component as chenille yarn passes through the upstream end 132 to the downstream end 134 of the adhesive activation chamber 130. As chenille yarn exits adhesive activation chamber 130, the chenille yarn 100 is tacky due to the activated adhesive. The optional cooling chamber 140 can allow chenille yarn 100 to harden prior to being wound onto the cone 125. Alternately, the chenille yarn 100 can be passed through ambient conditions for a distance sufficient to allow cooling prior to winding on the cone 125. The cooling chamber 140 has dimensions (height and width) such that multiple chenille yarns 100 may enter the cooling chamber 140. The length of the cooling chamber 140 may vary as long as the chenille yarn 100 is sufficiently cooled to harden the activated adhesive component. Desirably, the cooling chamber 140 comprises air at atmospheric conditions.

[0145] Upon cooling, the chenille yarn 100 has the pile or effect yarn securely attached to the core of the chenille yarn. Moreover, the chenille yarn 100 has an “orientation memory” heat set into the yarn even though the chenille yarn 100 is wound onto the cone 140. The “orientation memory” minimizes the curling associated with yarn when the yarn is unwound from a cone.

[0146] In yet another embodiment, the chenille yarn can be prepared as described in relation to FIG. 11, and the chenille yarn can be used in the preparation of a fabric. After formation of the fabric, the completed fabric can be subjected to activating conditions so that the adhesive component of the chenille yarn binds the effect yarn securely to the
core yarn. This method can be useful when storage conditions and fabric preparation conditions are not likely to adversely affect the chenille yarn. Certain conditions, particularly fabric preparation conditions, can have greatly adverse effects on the chenille fiber.

[0147] Thus, the present invention, in still another aspect, provides various fabrics prepared using the chenille yarn described herein. In certain embodiments, the chenille yarn can be fed directly from the forming process (such as described in relation to FIG. 11 or FIG. 12) into a fabric forming process (i.e., without the need for winding onto the cone for storage). In other embodiments, the previously formed chenille yarn can be obtained and used in the fabric forming process.

[0148] In one embodiment, as shown in FIG. 13, a chenille yarn 100 (from a cone or other storage device, or directly from a manufacturing process) is fed to a weaving machine 190 to produce a woven fabric 200. Suitable weaves may include, but are not limited to, shuttle looms, Rapier looms, air jet weaving machines, and water jet weaving machines. The ability to use such a variety of weaving machines, particularly air jet weaving and water jet weaving, arises from the increased strength and stability of the chenille yarn provided by the present invention. Specifically, pre-bonded chenille yarns, as described above, have their effect yarns sufficiently bonded to the core yarn so that the effect yarns are not displaced during the air jet or water jet weaving process. Preferably, weaving can proceed using the pre-bonded chenille yarn so that greater than 90% of the effect yarns remain bonded to the core yarn after weaving; even when using air jet or water jet weaving methods. In specific embodiments, at least 92%, at least 94%, at least 95%, at least 96%, at least 97%, at least 98%, or at least 99% of the effect yarns remain bonded to the core yarn after weaving, even when using air jet or water jet weaving methods.

[0149] In one embodiment of the present invention, the fabric 200 only requires washing and drying prior to consumer use. In other embodiments of the present invention, the fabric 200 is subjected to additional finishing processes. For example, the fabric 200 may be subjected to a coater apparatus 220 for applying a coating or finish thereto. Subsequently, the fabric 200 can be dried, such as in a tenter frame 230, to produce a finished roll of chenille fabric 250. Suitable fabric finishes include, but are not limited to, latex coating, elastomeric, bio-treatment, stain-proofing treatments, flame retardant treatment, anti-microbial surface treatments, dyeing and printing.

[0150] Fabrics made according to the present invention exhibit many characteristics that illustrate the improvement over the art achieved according to the invention. For example, the fabrics have improved abrasion resistance, as described previously, that far exceeds even the best chenille fabrics heretofore known in the industry. This is achieved by use of the described chenille yarns that incorporate the adhesive component of described herein. Moreover, this is possible in light of the ability according to the present invention to use multicomponent fibers in the core yarn of the overall chenille yarn. It has heretofore not been possible to prepare a stable multicomponent fiber that could function to provide the core yarn of the chenille yarn as well as incorporate an adhesive component into the overall chenille yarn. The present invention achieves this feat, however, and the resulting products benefit from the outstanding abrasion resistance imparted thereby.

[0151] These benefits are seen in the improved performance of the fabrics (i.e., the effect yarn fibers are harder to pull out of the fabric, such as by abrasion) made with chenille yarns incorporating the chenille core yarn of the invention, wherein the adhesive has been activated after formation of the chenille yarn and either before or after forming the fabric. This makes the fabrics more durable for existing applications and renders the fabrics suitable for applications for which their relatively low abrasion resistance currently renders them unacceptable. The improved abrasion resistance can also provide further advantages, such as permitting the use of cheaper, less-tightly-woven fabrics that still provide abrasion resistance that is at least as good as, and preferably greater than, the abrasion resistance of conventional chenille fabrics.

[0152] Furthermore, as noted above, activating the adhesive after forming the chenille yarn but prior to weaving the yarn into a fabric, provides the chenille yarn with an improved durability that makes the chenille yarn suitable for weaving on air-jet looms (or a water jet apparatus). This is not possible with conventional chenille yarns. Air-jet weaving can be a preferred method of preparing fabrics because of its productivity (which translates into decreased cost) in comparison to typical weaving methods required with conventional chenille yarns.

[0153] Moreover, this increased durability can actually allow for styling possibilities that currently unavailable using non-air-jet looms. Likewise, this more durable chenille yarn can allow for styling possibilities (regardless of the weaving technology) that are currently not possible because they introduce excessive exposure to abrasion that current chenille fabrics cannot withstand. For example, weave patterns with lengthy "floats" or jacquard patterns are typically not possible with chenille yarns. Such varied styling methods are made possible using the chenille yarn of the present invention.

[0154] The present invention will be further illustrated by the following non-limiting examples.

**EXAMPLE 1**

Polymer Blend Adhesive

[0155] One adhesive was prepared by blending 45% of a high molecular weight maleated polyethylene, such as EPOLENE® G-2608 (commercially available from Eastman Chemical) with 55% of a common paraffin, such as IGI 1230. The resulting blend exhibits sufficient melt strength for fiber spinning. Moreover, the adhesive bonds (without pressure) to acrylic at 120°C, which is a 60°C drop from the temperature required when using the G-2608 polymer alone. The mixture does not exhibit blocking on the package even when held at temperatures above the melting point of the paraffin.

**EXAMPLE 2**

Polymer Blend Adhesive Coated on a Yarn

[0156] An adhesive was prepared by blending 50% of a maleated polyethylene, such as EPOLENE® C-18 (number
average molecular weight of about 5,700 Da), with 50% of IGI 1230 paraffin wax. This material was coated onto an acrylic core yarn of a chenille yarn. The blend bonded in boiling water baths typical of dying processes, yet did not exhibit blocking. This example exemplifies a “100° C. flow system” as discussed herein.

[0157] The paraffin component alone exhibited blocking and no functionality for wet-out. The EPOLENE® wax exhibited too high a melting point to flow at the desired temperatures. The blend can penetrate readily into an effect yarn (such as an acrylic or cotton effect yarn) at about 100° C. (a temperature sufficient to drive off water) and can bind it in place for improved wear resistance.

EXAMPLE 3

Polymer Blend Adhesive Coated on a Yarn

[0158] A low molecular weight maleated polyethylene or polypropylene wax was blended with a high molecular weight polyethylene or modified polypropylene to give results similar to that exhibited by the blend of Example 2. The blend exhibited high flow yet good fiber-forming properties at remarkably low temperatures, and at the same time good integrity in uncontrolled storage conditions. This example exemplifies a “150° C. flow system” as discussed herein.

[0159] In this example, the polyethylene alone exhibited poor flow at this temperature and no functionality. The viscosity/melt strength of the wax was too low to be spun into fibers. The blend may be useful spun as the sheath of a bicomponent fiber. When heated in an autoclave, the bender readily penetrated into the effect yarn and held it in place for improved wear resistance.

EXAMPLE 4

Polymer Blend

[0160] A phenoxy polymer (MW about 20,000) is an amorphous polymer typically used as a binder in composite automotive structures such as headliners. The Tg is about 90° C. and is important to preventing creep at elevated temperatures of an automotive interior. The high molecular weight limits its ability to flow and wet out. The lack of crystallinity makes it difficult to spin into a fiber form, since it does not strain-harden.

[0161] Pentaeerythritol tetrabenozoate (PETB, available as LINPLEX® 552 from Unitex Chemical Co.), is a non-polymeric material having a molecular weight of 552 and a melting temperature of 104° C. at 10-25%. When PETB is blended with the phenoxy polymer, the phenoxy blend flows much more readily, giving superior wet-out. PETB is an example of a substantially crystalline plasticizer, which in the invention as discussed herein has a Tm that is greater than the Tg of the phenoxy. The improved flowability also allows spinning into a fiber form, in part because the melt now increases in modulus more when oriented (much like solution spinning). Normally one would expect that such a plasticizer would reduce Tg, which it does by as much as 25° C. However, because the PETB has a crystalline melt point higher than the Tg of the phenoxy, the mixture in fact shows a cold-flow point higher than the Tg of the unmodified phenoxy. Thus it continues to be useful as a binder in elevated temperature environments, does not creep excessively or become tacky as might be predicted by the Tg.

[0162] The above is similar to the effect seen in Example 1. Specifically, the high molecular weight maleated polyethylene in Example 1 is a desirable binder, yet will not flow well at the desired temperatures. Adding (crystalline) paraffin improves flow without making the blend tacky.

EXAMPLE 5

Abrasion Resistance

[0163] Two fabrics were prepared using chenille yarn, and the fabrics were tested to evaluate the abrasion resistance of the fabrics according to ASTM D4157-02, as described above. Fabric 1 was a conventional fabric (as described below), and Fabric 2 was made according to the invention.

[0164] Fabric 1 was prepared using a conventional chenille yarn having a weight of 1350 yds/lb, having 14.5 turns/inch in the core, and having a former length of 2 mm. The chenille core yarn was formed of two yarns, each being a 14/1 spun yarn made of 60/40 PET/aericl. The chenille effect yarns were 5/1 acrylic yarn. Fabric 1 was formed to have a weight of 13.5 ounce per linear yard, 20 warp ends per inch, and 13.5 picks per inch. A 2 ounce per linear yard acrylic latex backing was applied to the fabric. The backing was considered necessary to allow the conventional fabric to withstand the abrasion testing.

[0165] Fabric 2 (the inventive fabric) was prepared using an inventive chenille yarn having a weight of 1250 yds/lb, having 14.5 turns/inch in the core, and having a former length of 2 mm. Two chenille core yarns were used. The first core yarn was a 14/1 spun yarn made of 60/40 PET/aericl. The second core yarn was a multicomponent fiber as described herein. Particularly, the yarn was formed of 72 filaments and had an overall size of 320 denier. Each filament was a sheath/core fiber having a polypropylene core surrounded by a sheath formed of a polymer blend according to the invention. The chenille effect yarns were 5/1 acrylic yarn. Fabric 2 was formed to have a weight of 13.5 ounce per linear yard, 20 warp ends per inch, and 13.5 picks per inch. A two ounce per linear yard acrylic latex backing was applied to the fabric solely to be in accord with the structure of Fabric 1. After formation, Fabric 2 was put through a 60 ft. oven set at 270° C. at a rate of 25 yds/min to activate the adhesive component and bind the chenille effect yarn.

[0166] Both fabrics were subjected to identical testing according to ASTM D4157-02. The fabrics were also evaluated for tenacity, seam slippage, and seam strength. The results of the tests are provided below in Table 1.

<table>
<thead>
<tr>
<th>Test</th>
<th>Fabric 1 (Conventional Fabric)</th>
<th>Fabric 2 (Inventive Fabric)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tenacity:</td>
<td>50 lbs (wrap direction)</td>
<td>120 lbs (wrap direction)</td>
</tr>
<tr>
<td></td>
<td>80 lbs (filling direction)</td>
<td>57 lbs (filling direction)</td>
</tr>
<tr>
<td>Seam:</td>
<td>30 lbs (wrap direction)</td>
<td>54 lbs (wrap direction)</td>
</tr>
<tr>
<td></td>
<td>80 lbs (filling direction)</td>
<td>52 lbs (filling direction)</td>
</tr>
<tr>
<td>Slippage:</td>
<td>30 lbs (filling direction)</td>
<td>52 lbs (filling direction)</td>
</tr>
<tr>
<td>Seam:</td>
<td>80 lbs (wrap direction)</td>
<td>80 lbs (wrap direction)</td>
</tr>
<tr>
<td></td>
<td>80 lbs (filling direction)</td>
<td>52 lbs (filling direction)</td>
</tr>
<tr>
<td>Strength:</td>
<td>50 lbs (filling direction)</td>
<td>52 lbs (filling direction)</td>
</tr>
<tr>
<td>Abrasion:</td>
<td>Failure after 6,000 to</td>
<td>NO FAILURE after</td>
</tr>
<tr>
<td>Resistance:</td>
<td>12,000 cycles</td>
<td>100,000 cycles</td>
</tr>
</tbody>
</table>

As seen in Table 1, the inventive fabric outperformed the conventional in every test of the physical strength of the
fabric. Most importantly, the inventive chenille fabric did not fail the test even after 100,000 cycles. The test is conventionally stopped at 100,000 cycles as this is typically deemed to be the maximum threshold for definitively characterizing a fabric in terms of abrasion resistance. In other words, the inventive fabric achieved the highest performance typically evaluated in terms of abrasion resistance. By contrast, the conventional fabric failed after only 6,000 to 12,000 cycles. Thus, the inventive fabric out performed the conventional fabric by at least an order of magnitude.

[0167] Many modifications and other embodiments of the invention will come to mind to one skilled in the art to which this invention pertains having the benefit of the teachings presented in the foregoing descriptions. Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed and that modifications and other embodiments are intended to be included within the scope of the appended claims. Although specific terms are employed herein, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

That which is claimed is:

1. A chenille yarn comprising a first core yarn, a second core yarn, a plurality of effect yarn segments positioned by and extending radially from the core yarns, and an adhesive polymer blend adhering at least a portion of the effect yarn segments to at least one of the first and second core yarns, wherein the polymer blend is formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight that is less than the first molecular weight of the at least one polymer of the first blend component, wherein the polymer blend substantially wets out a surface at a flow activating temperature without requiring the application of pressure.

2. The chenille yarn of claim 1, wherein the first molecular weight of the at least one polymer of the first blend component is sufficiently high to prevent the substantial wet out of the at least one polymer of the first blend component at the activating temperature without the application of pressure.

3. The chenille yarn of claim 2, wherein the second molecular weight of the at least one compound of the second blend component is sufficiently low so that the at least one compound of the second blend component exhibits sufficiently high molecular mobility to prevent processing of the at least one compound of the second blend component alone.

4. The chenille yarn of claim 1, wherein the polymer blend substantially wets out a surface at the activating temperature without requiring the application of pressure in a time of about two minutes or less.

5. The chenille yarn of claim 1, wherein the activating temperature is about 75°C to about 175°C.

6. The chenille yarn of claim 1, wherein the first blend component comprises at least one polymer having a molecular weight that is at least about three times higher than the molecular weight of the at least one compound of the second blend component.

7. The chenille yarn of claim 1, wherein the first blend component comprises at least one polymer having a molecular weight that is at least about five times higher than the molecular weight of the at least one compound of the second blend component.

8. The chenille yarn of claim 1, wherein the first blend component comprises at least one polymer having a first melt flow rate, and the second blend component comprises at least one compound having a first melt flow rate.

9. The chenille yarn of claim 1, wherein the first blend component comprises at least one polymer having a first melt flow rate, and the second blend component comprises at least one compound having a second melt flow rate that is at least about five times greater than the first melt flow rate.

10. The chenille yarn of claim 1, wherein the polymer blend comprises at least one polymer selected from the group consisting of polyolefins, polyesters, acrylics, polyamides, elastomeric polymers, polyacrylonitrile, acetals, fluropolymers, epoxies, phenoxies, vinyl alcohol polymers, polyesterimides, polyhydroxy alkanoates (PHA), polysulphone, polyetheretherketone, cellulose acetate, rayons, bio-polymers, polyurethanes, hot melt adhesives, copolymers thereof, terpolymers thereof, ionomers thereof, and combinations thereof.

11. The chenille yarn of claim 1, wherein said polymer blend comprises at least one elastomeric polymer.

12. The chenille yarn of claim 1, wherein the at least one compound of the second blend component comprises a substantially crystalline or semicrystalline polymer.

13. The chenille yarn of claim 12, wherein the first blend component comprises at least one polymer having a glass transition temperature (Tg) and wherein the substantially crystalline or semicrystalline polymer has a melting point that is greater than the Tg of the at least one polymer of the first blend component.

14. The chenille yarn of claim 13, wherein the at least one polymer having the glass transition temperature (Tg) is a phenoxy compound.

15. The chenille yarn of claim 14, wherein the substantially crystalline or semicrystalline polymer is a plasticizer.

16. The chenille yarn of claim 15, wherein the substantially crystalline or semicrystalline polymer plasticizer has a molecular weight that is less than the molecular weight of the phenoxy and has a melting point that is greater than the Tg of the phenoxy compound.

17. The chenille yarn of claim 1, wherein at least one of the first and second blend components comprises a functionalized polymer.

18. The chenille yarn of claim 1, wherein at least one of the first and second blend components comprises a polyolefin.

19. The chenille yarn of claim 18, wherein both of the first and second blend components comprise a polyolefin.

20. The chenille yarn of claim 18, wherein the polyolefin is selected from the group consisting of polypropylene, polyethylene, polybutylene, copolymers thereof, terpolymers thereof, and combinations thereof.

21. The chenille yarn of claim 18, wherein the polyolefin is functionalized.

22. The chenille yarn of claim 18, wherein the polyolefin is elastomeric.

23. The chenille yarn of claim 18, wherein the polyolefin is functionalized by reaction with at least one unsaturated anhydride, unsaturated acid or unsaturated ester.
24. The chenille yarn of claim 18, wherein the polyolefin is modified by reaction with at least one unsaturated anhydride, unsaturated acid or unsaturated ester selected from the group consisting of maleic anhydride, citraconic anhydride, itaconic anhydride, glutaric anhydride, 2,3-dimethylmaleic anhydride, maleic acid, fumaric acid, citraconic acid, itaconic acid, mesaconic acid, glutaric acid, acrylic acid, methacrylic acid, crotonic acid, 2-pentenoic acid, 2-methyl-2-pentenoic acid, dimethyl maleate, diethyl maleate, di-n-propyl maleate, di-isopropyl maleate, diethyl fumarate, di-n-propyl fumarate, di-isopropyl maleate, dimethyl itaconate, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, methyl crotonate, and ethyl crotonate.

25. The chenille yarn of claim 18, wherein the polyolefin comprises a maleic anhydride modified polyolefin.

26. The chenille yarn of claim 18, wherein at least one of the first and second blend components comprises a maleic anhydride modified polyolefin, and the second component comprises a substantially crystalline polyolefin.

27. The chenille yarn of claim 1, wherein the polymer blend comprises a coating on at least a portion of at least one of the core yarns.

28. The chenille yarn of claim 1, wherein at least one of the core yarns comprises a multicomponent fiber, and wherein the polymer blend comprises at least one component of the multicomponent fiber.

29. The chenille yarn of claim 28, wherein the multicomponent fiber comprises a core-sheath fiber, and wherein the polymer blend comprises the sheath.

30. The chenille yarn of claim 1, wherein at least one of the core yarns comprises a material selected from the group consisting of polyamides, polyamides, polyimides, polyacrylics, polycarbonates, polydienes, polyoxides, polyesters, polyethers, polyfluorocarbons, polyolefins, polyphenylenes, silicon containing polymers, polyurethanes, polyvinyls, polyacetals, polyarylates, and copolymers thereof, terpolymers thereof, and combinations thereof.

31. A fabric comprising a chenille yarn according to claim 1.

32. A chenille yarn comprising a core yarn, a secondary core yarn, and a plurality of effector yarn segments positionally maintained by and extending radially from the core yarns, wherein at least one of the first and second core yarns comprises a continuous sheath/core filament, the sheath comprising an adhesive component.

33. The chenille yarn of claim 32, wherein the adhesive component comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight that is less than the first molecular weight of the at least one polymer of the first blend component, wherein the polymer blend substantially wets out a surface at a flow activating temperature without requiring the application of pressure.

34. The chenille yarn of claim 33, wherein the first molecular weight of the at least one polymer of the first blend component is sufficiently high to prevent the substantial wet out of the at least one polymer of the first blend component at the activating temperature without the application of pressure.

35. The chenille yarn of claim 34, wherein the second molecular weight of the at least one compound of the second blend component is sufficiently low so that the at least one compound of the second blend component exhibits sufficiently high molecular mobility to prevent processing of the at least one compound of the second blend component alone.

36. The chenille yarn of claim 33, wherein the adhesive comprises a blend of a polyolefin and a paraffin wax.

37. The chenille yarn of claim 32, wherein the adhesive comprises at least one maleic anhydride modified polymer.

38. The chenille yarn of claim 32 wherein the adhesive comprises at least one polyethylene oxide.

39. The chenille yarn of claim 32, wherein the adhesive comprises at least one polar, thermoplastic polymer having a melting temperature of less than 200°C.

40. The chenille yarn of claim 32, wherein the adhesive comprises a polymer blend capable of substantially wetting out a surface at a flow activating temperature without requiring the application of pressure, the polymer blend further having blocking resistance properties, the polymer blend comprising at least one polymer having a first molecular weight and a glass transition temperature (Tg), and a substantially crystalline compound having a second molecular weight that is less than the first molecular weight of the at least one polymer and having a melting point that is greater than the Tg of the at least one polymer.

41. The chenille yarn of claim 32, wherein the adhesive comprises a polymer blend capable of substantially wetting out a surface at a flow activating temperature without requiring the application of pressure, the polymer blend further having blocking resistance properties, the polymer blend comprising a phenoxo having a first molecular weight and a glass transition temperature (Tg), and a substantially crystalline plasticizer having a second molecular weight that is less than the first molecular weight of the phenoxo and having a melting point that is greater than the Tg of the phenoxo.

42. The chenille yarn of claim 32, wherein the adhesive comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight,

wherein the first molecular weight of the at least one polymer of the first blend component is at least about three times higher than the molecular weight of the at least one compound of the second blend component, and

wherein the polymer blend substantially wets out a surface without requiring the application of pressure at a temperature in the range of about 100°C to about 150°C.

43. The chenille yarn of claim 32, wherein the adhesive comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one elastomeric polymer, and the second blend component comprising a substantially crystalline or semicrystalline polymer.

44. The chenille yarn of claim 32, wherein the adhesive comprises metal particles.

45. The chenille yarn of claim 32, wherein, a fabric formed using the chenille yarn exhibits an abrasion resis-
tance measured in double strokes according to the ASTM D-4157 abrasion test of at least about 50,000 double strokes. 46. A fabric comprising a chenille yarn according to claim 32.

47. A product of manufacture comprising a fabric according to claim 46.

48. A fabric formed using a chenille yarn, the fabric exhibiting an abrasion resistance measured in double strokes according to the ASTM D-4157 abrasion test of at least about 50,000 double strokes, wherein the chenille yarn comprises a first core yarn, a second core yarn, a plurality of effect yarn segments positionally maintained by and extending radially from the core yarns, and an adhesive component adhering at least a portion of the effect yarn segments to at least one of the first and second core yarn.

49. The fabric of claim 48, wherein the fabric formed using the chenille yarn exhibits an abrasion resistance of at least about 60,000 double strokes.

50. The fabric of claim 48, wherein the fabric formed using the chenille yarn exhibits an abrasion resistance of at least about 70,000 double strokes.

51. The fabric of claim 48, wherein the fabric formed using the chenille yarn exhibits an abrasion resistance of at least about 80,000 double strokes.

52. The fabric of claim 48, wherein the fabric formed using the chenille yarn exhibits an abrasion resistance of at least about 90,000 double strokes.

53. The fabric of claim 48, wherein the fabric formed using the chenille yarn exhibits an abrasion resistance of at least about 100,000 double strokes.

54. The fabric of claim 48, wherein the chenille yarn has a weight of 1250 yards/pound and the fabric has a weight of 13.5 ounces per linear yard, has 20 warp ends per inch, having 13.5 picks per inch, and has a 2 ounce per linear yard acrylic latex backing applied thereto.

55. The fabric of claim 48, wherein the adhesive component comprises a coating on at least a portion of at least one of the core yarns.

56. The fabric of claim 48, wherein at least one of the core yarns comprises a multicomponent fiber, and wherein the adhesive component comprises at least one component of the multicomponent fiber.

57. The fabric of claim 56, wherein the multicomponent fiber comprises a core-sheath fiber, and wherein the adhesive component comprises the sheath.

58. The fabric of claim 48, wherein at least one of the core yarns comprises a material selected from the group consisting of polyamides, polyamines, polyimides, polyacrylics, polycarbonates, polydienes, polypepoxides, polystyres, polyethers, polyfluorocarbons, polyolefins, polyphenylenes, silicon containing polymers, polycarboxanes, polyvinyls, polyacetals, polyarylates, and copolymer thereof, terpolymers thereof, and combinations thereof.

59. The fabric of claim 48, wherein the adhesive component comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight that is less than the first molecular weight of the at least one polymer of the first blend component, wherein the polymer blend is capable of substantially wetting out a surface at a flow activating temperature without requiring the application of pressure.

60. The fabric of claim 59, wherein the first molecular weight of the at least one polymer of the first blend component is sufficiently high to prevent the substantial wet out of the at least one polymer of the first blend component at the activating temperature without the application of pressure.

61. The fabric of claim 60, wherein the second molecular weight of the at least one compound of the second blend component is sufficiently low so that the at least one compound of the second blend component exhibits sufficiently high molecular mobility to substantially prevent processing of the at least one compound of the second blend component alone.

62. The fabric of claim 48, wherein the adhesive comprises at least one maleic anhydride modified polymer.

63. The fabric of claim 48, wherein the adhesive comprises at least one polyethylene oxide.

64. The fabric of claim 48, wherein the adhesive comprises at least one polar, thermoplastic polymer having a melting temperature of less than 200°C.

65. The fabric of claim 48, wherein the adhesive comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight,

wherein the first molecular weight of the at least one polymer of the first blend component is at least about three times higher than the molecular weight of the at least one compound of the second blend component, and

wherein the polymer blend substantially wets out a surface without requiring the application of pressure at a temperature in the range of about 100°C to about 150°C.

66. The fabric of claim 48, wherein the adhesive comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one elastomeric polymer, and the second blend component comprising a substantially crystalline or semicrystalline polymer.

67. The fabric of claim 48, wherein the adhesive comprises metal particles.

68. A method of preparing a pre-bonded chenille yarn comprising:

feeding at least two core yarns and an effect yarn into a chenille machine, wherein at least one of the core yarns comprises continuous sheath/core filament, the sheath comprising an adhesive;

entangling the at least two core yarns and the effect yarn in the chenille machine;

removing from the chenille machine a non-bonded chenille yarn having a plurality of segments of the effect yarn extending radially from the at least two core yarns of the chenille yarn;

feeding the non-bonded chenille yarn into an adhesive activation chamber; and

heating the non-bonded chenille yarn sufficiently to activate the adhesive and adhesively bond the effect yarn to the core yarns, thereby forming a pre-bonded chenille yarn.
69. The method of claim 68, wherein the adhesion activation chamber comprises a continuous autoclave apparatus.

70. The method of claim 68, wherein the adhesive comprises metal particles, and wherein the adhesion activation chamber comprises an apparatus generating microwave radiation.

71. The method of claim 68, wherein the adhesive comprises a blend of a polyelefin and a paraffin wax.

72. The method of claim 68, wherein the adhesive comprises at least one maleic anhydride modified polymer.

73. The method of claim 68 wherein the adhesive comprises at least one polyethylene oxide.

74. The method of claim 68, wherein the adhesive comprises a polymer blend formed of a first blend component and a second blend component, the first blend component comprising at least one polymer having a first molecular weight, and the second blend component comprising at least one compound having a second molecular weight that is less than the first molecular weight of the at least one polymer of the first blend component, wherein the polymer blend substantially wets out a surface at a flow activating temperature without requiring the application of pressure.

75. The chenille yarn of claim 74, wherein the first molecular weight of the at least one polymer of the first blend component is sufficiently high to prevent the substantial wet out of the at least one polymer of the first blend component at the activating temperature without the application of pressure.

76. The chenille yarn of claim 75, wherein the second molecular weight of the at least one compound of the second blend component is sufficiently low so that the at least one compound of the second blend component exhibits sufficiently high molecular mobility to prevent processing of the at least one compound of the second blend component alone.

77. A method of air jet weaving a chenille fabric comprising feeding a pre-bonded chenille yarn prepared according to claim 68 into an air jet weaving apparatus.

* * * * *