

POLYMERIC YARN, COMPOSITION AND METHOD

FIELD OF THE DISCLOSURE

5 [0001] The present disclosure relates especially to textile industries, and, more particularly, to a polymeric yarn and composition having antimicrobial and/or antibacterial properties.

BACKGROUND OF THE DISCLOSURE

10 [0002] Textile industry has conventionally been using both natural and synthetic fibers for manufacture of various products. Each having their own advantages and shortcomings related to strength, comfort, softness, longevity and the like. With ever-increasing demand to provide enhanced quality fibers manufacturers apart from enhancing traditional properties, have started incorporating more functional elements to fibers to provide better comfort, 15 freshness, and hygiene to users. In pursuit of meeting demands of modern hygienic lifestyle, there have been several attempts to add a variety of chemical agents to fabrics providing them with antimicrobial and antibacterial properties. These agents are normally applied on the surface to impart antimicrobial and antibacterial properties to the fabrics during finishing stage.

20 [0003] However, items made with such fabrics are unable to retain antimicrobial and antibacterial properties for long and as the compounds are washed-off during washings or ultra-violet exposure. A significant reason that these fibers are not able to provide long-term antimicrobial and antibacterial effects lies in the fact that these components are added to the fiber during the fabric finishing stage through the use of various finishing chemicals. Moreover, there is always a 25 concern regarding use of such chemical agents and their potential after-effects on the human body.

 [0004] Therefore, there exists a need for innovation in relation to this technology to overcome the shortcomings prevalent in the market.

SUMMARY OF THE DISCLOSURE

[0005] In view of the foregoing disadvantages inherent in the prior art, a purpose of the present disclosure is to provide a polymeric yarn and composition having antimicrobial and/or antibacterial properties, to include all
5 advantages of the prior art, and to overcome the drawbacks inherent in the prior art.

[0006] Therefore, an object of the present disclosure is to provide a polymeric composition or polymeric yarn made from such composition, and method of making such polymeric composition or polymeric yarn that incorporates antimicrobial and/or antibacterial properties. Preferably, the polymeric composition
10 or polymeric yarn shows improved color fastness than previously exhibited.

[0007] Another object of the present disclosure is to provide a polymeric composition or polymeric yarn having an herbal masterbatch with herbal component therein that incorporates antimicrobial and/or antibacterial properties.

[0008] Another object of the present disclosure is to provide a
15 method for preparing a polymeric yarn having an herbal masterbatch with herbal component therein that incorporates antimicrobial and/or antibacterial properties.

[0009] In light of the above objects, in one aspect, a polymeric composition having antimicrobial and/or antibacterial properties e.g. for textile materials is provided. The polymeric composition includes: (i) an herbal masterbatch, and (ii) a base polymer. The base polymer may include one of
20 polybutylene terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene. Further, the herbal masterbatch, in one embodiment, may include: (a) an herbal component that may include Neem or Turmeric or combination or extract thereof, preferably in a range of 1% w/w to 75% w/w, and
25 (b) a carrier polymer, preferably in a range of 25% w/w to 99% w/w. The carrier polymer may be the same as the base polymer and may include at least one of: polybutylene terephthalate (PBT), polyethylene terephthalate (PET), or polyamides, polypropylene. In one embodiment, in order to make a polymeric yarn, the herbal masterbatch and the base polymer may be melted and extruded together
30 at a temperature in a range of 175°C to 300°C to obtain the polymeric yarn having the herbal component in a range of 0.01% to 10% in weight of the polymeric yarn.

Alternatively, the herbal component may be present in the final product in an amount of from 0.01% to less than 1.0 % or from 0.01% to 0.9 % or from 0.02% to 0.8% in weight of the polymeric material. A preferred herbal component is tetrahydrocurcumin (THC) or equivalent hydrogenated extract of turmeric. Such
5 extracts have been found to be more efficacious, allowing lower quantities to be used, while having better color fastness. Other items of manufacture requiring antimicrobial and/or antibacterial properties may also be produced using the polymeric composition by extrusion, molding, 3-D printing, spinning or the like.

[0010] In light of the above objects, in another aspect, a method for
10 preparing a polymeric yarn having antimicrobial and/or antibacterial properties for textile materials is provided. The method may include: preparing an herbal masterbatch, wherein the herbal masterbatch includes: (i) an herbal component or extract of Neem or Turmeric or combination thereof, preferably in a range of 1% w/w to 75% w/w, and a carrier polymer having at least one of polybutylene
15 terephthalate (PBT), or poly(ethylene terephthalate) (PET), polyamides, or polypropylene, wherein the carrier polymer is preferably in a range of 25% w/w to 99% w/w; ; (ii) mixing the herbal masterbatch with a base polymer, optionally in a range of 0.01% w/w to 10% w/w herbal masterbatch to 90% w/w to 99.99% w/w of the base polymer, wherein the base polymer comprises one of polybutylene
20 terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene; and (iii) melting and extruding the mixture of the herbal masterbatch and the base polymer at a temperature in a range of 175°C to 300°C to obtain the polymeric yarn having the herbal component in a range of 0.01% to 10% by weight of the polymeric yarn. Alternatively, the herbal component may be
25 present in the final product in an amount of from 0.01% to less than 1.0 % or from 0.01% to 0.9 % or from 0.02% to 0.8% in weight of the polymeric material. A preferred herbal component is tetrahydrocurcumin (THC) or equivalent hydrogenated extract of turmeric. Other items of manufacture requiring antimicrobial and/or antibacterial properties may also be produced using the
30 polymeric composition by extrusion, molding, 3-D printing, spinning or the like.

[0011] In one embodiment of the present disclosure, preparing the herbal masterbatch may include: (i) melting a mixture of the herbal component and the carrier polymer at a temperature in a range of 175°C to 300°C to obtain a melted homogeneous mixture of the herbal component and the carrier polymer, wherein
5 the mixture of the herbal component and the carrier polymer comprises: Neem or Turmeric or extract or combination thereof, preferably in the range of 1% w/w to 75% w/w, and the carrier polymer having at least one of the polybutylene terephthalate (PBT), or the poly(ethylene terephthalate) (PET), or the polyamides, or polypropylene, wherein the carrier polymer is preferably in the range of 25%
10 w/w to 99% w/w; and (ii) solidifying the melted homogeneous mixture herbal component and the carrier polymer underwater at a temperature in a range of 4°C to 30°C to obtain the herbal masterbatch.

[0012] In light of the above objects, in another aspect, an herbal masterbatch composition is provided. The herbal masterbatch includes an herbal
15 component and a carrier polymer. The herbal component may include Neem or Turmeric or extract or combination thereof in a preferred range of 1% w/w to 75% w/w. Further, the carrier polymer may include at least one of: polybutylene terephthalate (PBT), polyethylene terephthalate (PET), or polyamides, or polypropylene. The carrier polymer may be in a preferred range of 25% w/w to 99%
20 w/w. In one embodiment of the present disclosure, the Neem or Turmeric or combination thereof may be used in a powder form having size of the powder is in a range of 0.001 microns to 25 microns to make the polymeric yarn. In another embodiment, the Neem or Turmeric or extract or combination thereof may be used in a liquid form to make the polymeric yarn. In a particular aspect, the herbal
25 component may be tetrahydrocurcumin (THC) or equivalent hydrogenated extract of turmeric, present in the polymer masterbatch in an amount of from 0.01 wt% to 75 wt %, preferably in an amount of from 0.5 wt% to 10 wt%. In an aspect, the herbal masterbatch may be used for making a polymeric yarn, fiber or filament for textile materials as described above and hereinafter.

30 [0013] In light of the above objects, in yet another aspect, a polymeric yarn, fiber or filament for making textile material is provided. The

polymeric yarn, fiber or filament may include an herbal component having Neem or Turmeric or extract or combination thereof; and a base polymer having one of polybutylene terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene, wherein the herbal component in the polymeric yarn is in a range of 0.01% to 10% based on the weight of the polymeric yarn. Alternatively, the herbal component may be present in the final product in an amount of from 0.01% to less than 1.0 % or from 0.01% to 0.9 % or from 0.02% to 0.8% in weight of the polymeric material. A preferred herbal component is tetrahydrocurcumin (THC) or equivalent hydrogenated extract of turmeric. In one aspect, the yarn, fiber or filament is a colored yarn having improved color fastness.

[0014] In the above, the yarn, polymeric composition, herbal masterbatch or item of manufacture may be colored in any suitable manner. In one preferred embodiment, a yarn, filament, fiber or other item of manufacture is colored by solution dyeing using a colored masterbatch. The colored masterbatch may be provided in an overall amount of between 0.1% and 20% by weight of the final product, preferably between 1% and 10% or between 2% and 4%. The colored masterbatch may be added separately or combined with the herbal masterbatch. The skilled person will be aware that other procedures for providing color to such components may also be performed. In particular, yarns or textiles may be dyed by any other conventional process such as vat dyeing, using any suitably dye, including but not limited to acid dyes and dispersed dyes.

[0015] This together with the other aspects of the present disclosure, along with the various features of novelty that characterize the present disclosure, is pointed out with particularity in the claims annexed hereto and forms a part of the present disclosure. For a better understanding of the present disclosure, its operating advantages, and the specified object attained by its uses, reference should be made to the accompanying drawings and descriptive matter in which there are illustrated exemplary embodiments of the present disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The advantages and features of the present disclosure will become better understood with reference to the following detailed description taken in conjunction with the accompanying drawings, in which:

5 [0017] FIGS. 1A to 1C illustrate various kind of yarns having herbal content therein that exhibits antimicrobial and/or antibacterial properties for textile materials, in accordance with an exemplary embodiment of the present disclosure; and

[0018] FIGS. 2A and 2B illustrate methods of making yarns of
10 FIGS. 1A to 1C, in accordance with an exemplary embodiment of the present disclosure.

[0019] Like reference numerals refer to like parts throughout the description of several views of the drawing.

15 DETAILED DESCRIPTION OF THE DISCLOSURE

[0020] The exemplary embodiments described herein detail for illustrative purposes are subject to many variations in implementation. The present disclosure provides a polymeric yarn and composition having antimicrobial and/or antibacterial properties. It is understood that the teachings may equally be applied
20 to other polymeric items of manufacture, including but not limited to filaments, fibers and molded or 3-D printed items and that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but these are intended to cover the application or implementation without departing from the spirit or scope of the present disclosure.

25 [0021] The terms “a” and “an” herein do not denote a limitation of quantity, but rather denote the presence of at least one of the referenced items.

[0022] The terms “having”, “comprising”, “including”, and variations thereof signify the presence of a component.

[0023] The term “% w / w” or wt % used herein means grams of
30 solute dissolved in 100 grams of solution or grams per 100 grams of the whole.

[0024] The present disclosure provides a polymeric composition having antimicrobial and/or antibacterial properties that may be used in yarns, filaments and fibers for textile materials. In one embodiment of the present disclosure, the polymeric composition may include an herbal masterbatch and a base polymer. In one example of the present disclosure, the polymeric composition may include the herbal masterbatch in a range of 0.01% w/w to 10% w/w, and the base polymer may be in a range of 90% w/w to 99.99% w/w, which means that if 0.01% w/w of herbal masterbatch is used then 99.99 w/w of the base polymer may be used, and if 10% w/w of herbal masterbatch is used then 90% w/w of the base polymer may be used. In further example embodiment of the present disclosure, the polymeric composition may include the herbal masterbatch in a preferable range of 0.1% w/w to 8% w/w, and the base polymer may be in a preferable range of 99.9 w/w % to 92% w/w, which means that if 0.1%w/w of herbal masterbatch is used then 98% w/w of the base polymer may be used, and if 8% w/w of herbal masterbatch is used then 92% w/w of the base polymer may be used. In yet another example embodiment of the present disclosure, the polymeric composition may include the herbal masterbatch in a more preferable range of 2% w/w to 5% w/w, and the base polymer may be in a most preferable range of 98% w/w to 95% w/w, which means that if 2% w/w of herbal masterbatch is used then 98% w/w of the base polymer may be used, and if 5% w/w of herbal masterbatch is used then 95% w/w of the base polymer may be used. The skilled person will be aware that the choice of the ratio of herbal masterbatch to base polymer will generally depend on the manufacturing process and the ability to accurately dose and mix the masterbatch. A more concentrated masterbatch, will require more accurate dosage and may be more susceptible to variations but will have the advantage of requiring smaller stocks of masterbatch.

[0025] The herbal masterbatch, in such embodiment of the polymeric composition, may include the herbal component that may have Neem or Turmeric or extract or combination thereof in a range of 1% to 75% w/w, preferably in a range of 10% w/w to 40% w/w; more preferably in a range of 20% w/w to 30% w/w, for example about 25% w/w or 30% w/w. Further, the herbal masterbatch, in

such embodiment of the polymeric composition, may include a carrier polymer in a range of 25% w/w to 99% w/w; preferably in a range of 90% w/w to 60% w/w; more preferably in a range of 80% w/w to 70% w/w, for example about 75% w/w or 70% w/w. In one embodiment of the present disclosure, the Neem or Turmeric or extract or combination thereof may be used in a powder form having a size of the powder in a range of 0.001 microns to 25 microns to make the herbal masterbatch. In another embodiment, the Turmeric or extract or combination thereof may be used in a liquid form to make the herbal masterbatch. The skilled person will be aware that for herbal extracts of greater purity, a lower amount of the herbal component may be required. In particular, for THC, amounts below 1 wt % in the masterbatch may be sufficient. The herbal component may thus also be present in an amount from 0.2 wt % to 1.0 wt% or from 0.3 wt % to 1.0 wt% or around 0.5 wt %. Again, of importance is the amount of herbal component in the finished product and the concentration and amount of masterbatch may be more dependent on processing convenience and accuracy. Furthermore, the carrier polymer, in such herbal masterbatch, may be one of polybutylene terephthalate (PBT), polyethylene terephthalate (PET), polyamides or polypropylene. In one embodiment, a chemical extract of Neem or Turmeric or combination thereof may be used to make the herbal masterbatch. Such chemical extract that may be extracted from the Neem may include, but not limited to, nimbin, nimbanene, 6-desacetylnimbinene, nimbandiol, nimbolide, ascorbic acid, n-hexacosanol and amino acid, 7-desacetyl-7-benzoylazadiradione, 7-desacetyl-7-benzoylgedunin, 17-hydroxyazadiradione and nimbiol [3], [10], [12]. Further, the chemical extract that may be extracted from the Turmeric may include, but is not limited to, Curcuminoids or Curcumin in particular, tetrahydrocurcumin. One or other chemical extract of Neem or Turmeric may be used in combination or alone to obtain the effective result.

[0026] The base polymer, in such embodiment of the polymeric composition, may include one of polybutylene terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene. In one embodiment of the present disclosure, the polyamides may generally include Polyamide 6 (PA6) or

Polyamide 66 (PA66). In one preferred embodiment of the present disclosure, the base polymer and the carrier polymer may generally be of the same polymer group in such polymeric composition.

[0027] The polymeric composition as described above may be
5 utilized to manufacture a polymeric yarn 100 or a twisted continuous polymeric yarn 200 or a bulk continuous filament (BCF) polymeric yarn 300 as shown in FIGS. 1A, 1B and 1C. Such yarns made from the polymeric composition as described above exhibit antimicrobial and/or antibacterial properties. Those manufactured using THC also exhibit very favorable color and light fastness.

10 [0028] In one embodiment of the present disclosure, a block diagram of a method 400 for preparing such polymeric yarn 100 or the twisted continuous polymeric yarn 200 or the BCF yarn 300 having antimicrobial and/or antibacterial properties is illustrated in FIG. 2A. The method 400 may include, at 410, preparation of an herbal masterbatch, such as the herbal masterbatch as
15 described above.

[0029] In one embodiment of the present disclosure, preparation of the herbal masterbatch may include certain steps, such as steps 412, 414 and 416, as shown in FIG. 2B. Preparation of the herbal masterbatch may, at 412, include mixing the herbal component having chemical extract of Neem or Turmeric or
20 combination thereof, and the carrier polymer, for example, PBT, PET, polyamides, or polypropylene, in desired proportion as mentioned above. Further, at 414, the mixture of the herbal component and the carrier polymer are melted at a temperature in a range of 175°C to 300°C; preferably in a range of 200°C to 275°C; more preferably in a range of 220°C to 275°C, to obtain a melted homogeneous mixture
25 of the herbal component and the carrier polymer. Furthermore, at 416, the melted homogeneous mixture of the herbal component and the carrier polymer, may be solidified at a temperature in a range of 4°C to 30°C to obtain the herbal masterbatch. Subsequently, as per the requirement, the herbal masterbatch may go under granulation, which involves cutting the masterbatch into granules of the size
30 in the range of 40 chips per gram to 200 chips per gram; preferably in the range of

60 chips per gram to 100 chips per gram; more preferably in the range of 70 chips per gram to 90 chips per gram.

[0030] Referring back to FIG. 2A, at 420, the base polymer, which includes one of PBT, PET, polyamides, polypropylene is prepared in the form of granules. Furthermore, at 430 the herbal masterbatch and the base polymer are mixed together in desired ranges such as described above. Moreover, at 440, the mixture of the herbal masterbatch and the base polymer are melted and extruded at a temperature in a range of 175°C to 300°C; preferably in a range of 200°C to 290°C; more preferably in a range of 220°C to 280°C, to obtain the polymeric yarn having the herbal component in a range of 0.01% to 10%; preferably in the range of 0.01% to 1%; more preferably, in the range of 0.01% to 0.9%, by weight of the polymeric yarn.

[0031] In one embodiment of the present disclosure, the polymeric yarn 100 may be formed by a single-step continuous process, on a single machine line, including the steps of: extruding, spinning, quenching, spin finish application, drawing, and/or texturing, cooling, intermingling and winding at the predetermined parameters. In such embodiment of the present disclosure, the mixture of the herbal masterbatch and the base polymer are melted and extruded at the gradual temperature having a range of 175°C to 300°C through a plurality of temperature zones, and at a pressure range of 60bars to 130bars. Further, the step of spinning is performed, followed by a gradual quenching, at the predetermined parameters, via, an air flow, having a quenching air flow temperature in a range of 10°C to 25°C, quenching air flow rate in a range of 0.1 m/sec to 0.4 m/sec, and quenching air flow pressure in a range of 1bars to 4bars. After quenching, spin finish application is performed. Furthermore, after the spin finish application, the spin finish application yarn is sequentially drawn at predetermined parameters, such as drawing speed and drawing temperature. In one embodiment of the present disclosure, the drawing speed may be in a range of 760mpm to 3500mpm, and the drawing temperature range may be in a range of 80°C to 190°C. Thereafter, the drawn yarn may be optionally textured at a texturing temperature range of 120°C to 190°C and a texturing vacuum pressure range of 50mbars to 150mbars. The drawn yarn may be

cooled intermingled and wound to obtain the polymeric yarn 100 having the herbal component in a range of 0.01% to 10%; preferably in a range of 1% to 8%; more preferably greater than 1% to up to 6%, on weight of the polymeric yarn.

[0032] Referring back to FIG. 2A, in one embodiment of the present disclosure, the method 400, at 430, may further include cabling or twisting the polymeric yarn in a range of 40 TPM (Twist Per Meter) to 350TPM; preferably in a range of 120TPM to 230TPM; more preferably in a range of 180TPM to 220TPM to obtain the polymeric yarn with twists 200 (hereafter may also be referred to as “twisted polymeric yarn 200”), as shown in FIG. 1B. Such twisted polymeric yarn 200 may also include the herbal component in the range of 0.01% to 10%; preferably in the range of 1% to 8%; more preferably, greater than 1% to up to 6%, on weight of the polymeric yarn.

[0033] Furthermore, in one embodiment of the present disclosure, the method 400, at 440, may further include heat setting the twists of the polymeric yarn, such as the BCF yarn 300. Heat treating may be carried out by a fluid, such as air, steam, or any other compressible liquid or vapor capable of transferring heat to the twisted yarn as it continuously travels through a heat setting device. The temperature of such fluid must be such that the yarn does not melt. If the temperature of the yarn is above the melting point of the yarn it is necessary to shorten the time in which the yarn dwells in the heat setting device. This step of heat setting utilizes such stream capable of transferring heat to the twisted yarn as it continuously travels through the heat setting device, at a temperature 100°C to 200°C; preferably 120°C to 190°C; more preferably 125°C to 190°C. This process is affected by the length of time during which the twisted yarn is exposed to the heating medium (time/temperature effect). Generally, useful exposure times are from 30 seconds to 90 seconds; preferably from 40 seconds to 60seconds.

[0034] In another aspect of the present disclosure, a polymeric yarn, such as the yarns 100, 200 and 300 may be made with an herbal component (not necessarily the herbal masterbatch) having the chemical extract of Neem or Turmeric or combination thereof; and the base polymer having one of PBT, PET, polyamides, polypropylene, wherein the herbal component in the polymeric yarn is

in a range of 0.01% to 10%; preferably in the range of 0.01% to 1%; more preferably, in the range of 0.01% to 0.9%, by weight of the polymeric yarn. The production of pre-mixed polymeric compositions for use in manufacturing of components, including yarns, filaments, fibers and other items of manufacture, is sometimes referred to compounding. The polymeric composition is thus pre-mixed in the required proportions as disclosed above and hereinafter, including herbal component and any required color component for producing the end product.

[0035] In one embodiment of the present disclosure, the polymeric yarns, such as the yarns 100, 200 and 300 may exhibit a denier per filament (DPF) ratio measuring in a range of 0.5 DPF to 50 DPF; preferably in a range of 1 DPF to 40 DPF; more preferably in a range of 3 DPF to 20 DPF .

[0036] In one embodiment of the present disclosure, the one or more of the polymeric yarns, fibers or filaments as described above, may be used to make or be included in, various kind of textile materials, including but not limited to: floor coverings such as carpets, mats and rugs; seat coverings and upholstery; woven fabrics; knitted fabrics; tufted fabrics; fleeces; non-wovens; felts; and so forth. The present disclosure further relates to textile materials comprising fibers, filaments or yarns formed from a polymer composition comprising from 0.01 wt % to 10 wt% of a herbal component of Neem or Turmeric, in particular THC. In an embodiment, the herbal component is by weight of the textile material, which may include, but is not limited to, either one of knitted, tufted, non-woven or woven textile materials.

[0037] As tested in the lab, the textile material made from such yarns shows tremendous improvement in killing or controlling the growth of bacteria or microorganism that may flourish on textile materials. More specifically, use of the herbal composition shows tremendous improvement in killing or controlling the growth of bacteria, particularly gram positive and gram negative bacteria, or microorganism, on the textile materials by about 90% to 99.99%, as shown by various lab test presented in Table 1 below:

Polymeric Yarn	Test done on	Herbal Masterbatch % in Yarn	Herbal component in Masterbatch (%)	Herbal Component in yarn (%)	Base Polymer in Yarn (%)	Denier	No of Filament	% Reduction in gram positive and gram negative bacteria and microorganisms
Herbal Masterbatch (Neem)+ Base polymer (PA6)	Yarn	1.00%	20.00%	0.20%	99.80%	1288	66	fabric doesn't show any antibacterial activity
Herbal Masterbatch (Neem)+ Base polymer (PA6)	Yarn	2.00%	20.00%	0.40%	99.60%	1288	66	98%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	Yarn	3.00%	20.00%	0.60%	99.40%	1288	66	97%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	Yarn	4.00%	20.00%	0.80%	99.20%	1288	66	97%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	Yarn	4.00%	20.00%	0.80%	99.20%	1288	66	98%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Yarn	4.00%	20.00%	0.80%	99.20%	1200	120	97%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Yarn	4.00%	20.00%	0.80%	99.20%	1200	120	96%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Yarn	5.50%	20.00%	1.10%	98.90%	1200	120	97%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	BCF Tuft	2.00%	20.00%	0.40%	99.60%	1288	68	94%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	BCF Tuft	3.00%	20.00%	0.60%	99.40%	1288	68	96%
Herbal Masterbatch (Neem)+ Base polymer (PA6)	BCF Tuft	4.00%	20.00%	0.80%	99.20%	1288	68	96%

Herbal Masterbatch (Turmeric)+ Base polymer (PA6)	BCF Tuft	2.00%	6.00%	0.12%	99.88%	1200	68	90%
Herbal Masterbatch (Turmeric)+ Base polymer (PA6)	BCF Tuft	3.00%	6.00%	0.18%	99.82%	1200	68	88%
Herbal Masterbatch (Turmeric)+ Base polymer (PA6)	BCF Tuft	4.00%	6.00%	0.24%	99.76%	1200	68	93%
Herbal Masterbatch (Neem + Turmeric)+ Base polymer (PA6)	BCF Tuft	2.00%	14.00%	0.28%	99.72%	1200	68	95%
Herbal Masterbatch (Neem + Turmeric)+ Base polymer (PA6)	BCF Tuft	3.00%	14.00%	0.42%	99.58%	1200	68	94%
Herbal Masterbatch (Neem + Turmeric)+ Base polymer (PA6)	BCF Tuft	4.00%	14.00%	0.56%	99.44%	1200	68	94%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	BCF Tuft	2.00%	20.00%	0.40%	99.60%	1200	120	90%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	BCF Tuft	3.00%	20.00%	0.60%	99.40%	1200	120	95%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	BCF Tuft	4.00%	20.00%	0.80%	99.20%	1200	120	96%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Heat set tuft	2.00%	20.00%	0.40%	99.60%	1200	120	97%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Heat set tuft	3.00%	20.00%	0.60%	99.40%	1200	120	91%
Herbal Masterbatch (Neem)+ Base polymer (PBT)	Heat set tuft	4.00%	20.00%	0.80%	99.20%	1200	120	93%

Table 1

[0038] An exemplary test protocol according to AATCC TM100-2012 is shown for reference below. Each test was performed on 4 swatches in the form of 48 mm disks of fabric using *Staphylococcus aureus* and *Klebsiella pneumoniae*:

5

TEST REPORT				
			NUMBER :	BOMT20016997
			DATE :	27-Jun-2020
TEST CONDUCTED (AS REQUESTED BY THE APPLICANT)				
1. Antimicrobial Activity [Quantitative] (AATCC 100-2012)				
Name of the test: Evaluation of Antimicrobial activity by AATCC 100-2012				
Organisms used:				
1. <i>Staphylococcus aureus</i> Strain No. ATCC 6538 (Gram Positive Bacteria) 1.7×10^5 cfu/ml				
2. <i>Klebsiella pneumoniae</i> Strain No. ATCC 4352 (Gram Negative Bacteria) 1.6×10^5 cfu/ml				
Additional Information:				
1. Sample size: 48mm discs cut from larger submitted samples				
2. No. of swatches used: 4(1 swatches per 100ml inoculation jar)				
3. Method of sterilization: Free steaming using Autoclave				
4. Inoculum Carrier: Phosphate Buffered water				
5. Neutraliser: DE Broth				
6. Contact time: 24 hrs				
7. Control sample: Sample at '0' contact time				
8. cfu: colony forming unit				
9. Percentage reduction of Microorganisms (R): $100 \times (B-A/B)$				
ANTIMICROBIAL ACTIVITY RESULTS				
Sample Identification	Test Culture	No. of colonies recovered at '0' hr [B]	No. of colonies recovered at '24' hrs [A]	Reduction of Microorganisms [R]
Hess Sample	<i>S. aureus</i>	1.62×10^5	2.8×10^3	98.27%
	<i>K. pneumoniae</i>	1.85×10^5	3.3×10^3	98.21%
INFERENCE: The Hess Sample received for antibacterial property analysis when tested as per AATCC 100 method showed 98% antibacterial activity for both bacteria.				

[0039] As presented, the present disclosure is advantageous in providing such composition, yarn or textile material that may control the growth or kills bacteria or microorganism that may flourish on textile materials. More specifically, the present disclosure is advantageous in providing such textile

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material that may control the growth or kills bacteria or microorganism via the herbal means that may flourish on textile materials. Furthermore, the present disclosure is advantageous in providing a method of preparing such textile material that may control the growth or kills bacteria or microorganism via the herbal means
5 that may flourish on textile materials.

[0040] Further tests performed according to AATCC TM100-2019 have shown that the antibacterial activity is retained without significant reduction even after 50 washes. As the herbal component is provided in the form of a masterbatch or is otherwise intimately distributed through the component, it is not
10 subject to being washed off as may be the case with finishes and coatings.

[0041] Additionally, yarns are tested for color fastness to light according to ISO 105-B02:2014. Accordingly, polyester yarns of 1250 denier/240 filaments were extruded to include 3% of a masterbatch incorporating 2% active curcumin. The curcumin masterbatch exhibits a natural dark yellow color, which gives
15 the yarn a light yellow tone. The resulting yarns had a total curcumin content of 0.06 % by weight. Three shades of solution or dope dyed yarn were tested, together with an undyed version (colored only by the curcumin).

[0042] The results of testing are shown in Table 2 below, illustrating consistent test results of 1-2, meaning a very poor color fastness to light.
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Polymer Type	DEN/FIL	SHADE	Herbal component	Test Method	Test Results
PET	1250 den / 240 Fil	Raw White	2% Curcumin in masterbatch, and 3% loading in spinning, effective content of curcumin in final yarn 0.06%	Colour Fastness to light (Up to grade 6) ISO 105 B02	1-2
	1250 den / 240 Fil	Light Shade (Pigment dope dyed)			1-2
	1250 den / 240 Fil	Medium Shade (Pigment dope dyed)			1-2
	1250 den / 240 Fil	Dark Shade (Pigment dope dyed)			1-2

Table 2

[0043] In a comparative test, polyester yarns of 1325 denier/144 filaments were extruded to include 2% of a masterbatch incorporating 3%
25 tetrahydrocurcumin. The resulting yarns had a total THC content of 0.3 % by

weight. The THC structure is without unsaturated C=C bonds compared to curcumin, thus lacking the conjugate double bonds that exhibit the yellow color. In terms of color, THC is white and the products made with THC, exhibit a natural white or light creamish color allowing colored yarns to be produced without any significant tonal deviation. Three shades of solution or dope dyed yarn were tested, together with an undyed version.

[0044] The results of testing are shown in Table 3 below, illustrating consistent test results of 6, which is a standard acceptance level in the industry for color fastness to light.

Polymer Type	DEN/FIL	SHADE	Herbal Component	Test Method	Test Results
PET	1325 den 144 fil	Raw white	2% THC in masterbatch, and 3% loading in spinning, effective content of THC in final yarn 0.06%	Colour Fastness to light (Up to grade 6) ISO 105 B02	6
	1325 den 144 fil	Light Shade (Pigment dope dyed)			6
	1325 den 144 fil	Medium Shade (Pigment dope dyed)			6
	1325 den 144 fil	Dark Shade (Pigment dope dyed)			6

Table 3

[0045] The foregoing descriptions of specific embodiments of the present disclosure have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the present disclosure to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teaching. The embodiments were chosen and described in order to best explain the principles of the present disclosure and its practical application, and to thereby enable others skilled in the art to best utilize the present disclosure and various embodiments with various modifications as are suited to the particular use contemplated. It is understood that various omissions and substitutions of equivalents are contemplated as circumstances may suggest or render expedient, but such omissions and substitutions are intended to cover the application or implementation without departing from the spirit or scope of the present disclosure.

CLAIM:

1. A polymeric yarn composition having antimicrobial and/or antibacterial properties for textile materials, the polymeric yarn composition comprising:

5 (i) an herbal masterbatch, preferably in a range of 0.01% w/w to 10% w/w, the herbal masterbatch comprising:

(a) an herbal component having Neem or Turmeric or combination thereof, preferably in a range of 1% w/w to 75% w/w, and

10 (b) a carrier polymer having at least one of: polybutylene terephthalate (PBT), polyethylene terephthalate (PET), or polyamides, polypropylene, wherein the carrier polymer is preferably in a range of 25% w/w to 99% w/w; and

15 (ii) a base polymer having one of polybutylene terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene, preferably in a range of 90% w/w to 99.99% w/w,

wherein the herbal masterbatch and the base polymer are melted and extruded together at a temperature in a range of 175°C to 300°C to obtain a polymeric yarn having the herbal component in a range of 0.01% to 10% in weight of the polymeric yarn.

20 2. The polymeric yarn composition of claim 1, wherein the polymeric yarn is configured to reduce gram positive and gram negative bacteria and microorganisms by about 85% to 99.99%.

3. The polymeric yarn composition of claim 1, wherein the textile materials made from the polymeric yarn includes floor covering materials.

25 4. The polymeric yarn composition of claim 1, wherein the textile materials made from the polymeric yarn comprise either one of knitted, tufted, or woven textile materials.

5. The polymeric yarn composition of claim 1, wherein the Neem or

Turmeric or combination thereof is used in a powder form, and wherein a size of the powder is in a range of 0.001 microns to 25 microns.

6. The polymeric yarn composition of claim 1, wherein the Neem or Turmeric or combination thereof is used in a liquid form.

5 7. The polymeric yarn composition of claim 1, wherein the polyamides comprise PA6 or PA66.

8. The polymeric yarn composition of claim 1, wherein the polymeric yarn exhibits a denier per filament (DPF) ratio measuring in a range of 0.5 DPF to 50 DPF.

10 9. The polymeric yarn composition of claim 1, wherein the polymeric yarn is cabled with at least 1 ply between 40 TPM (Twist Per Meter) to 350TPM to obtain a polymeric yarn with twists.

10. The polymeric yarn composition of claim 9, wherein the polymeric yarn with twists is heat set.

15 11. A method for preparing a polymeric yarn having antimicrobial and/or antibacterial properties for textile materials, the method comprising:

preparing an herbal masterbatch, wherein the herbal masterbatch comprises: an herbal component having Neem or Turmeric or combination thereof, preferably in a range of 1% w/w to 75% w/w, and a carrier polymer having at least one of
20 polybutylene terephthalate (PBT), or poly(ethylene terephthalate) (PET), polyamides, or polypropylene, wherein the carrier polymer is preferably in a range of 25% w/w to 99% w/w;

mixing the herbal masterbatch in a preferred range of 0.01% w/w to 10% w/w, and a base polymer in a preferred range of 90% w/w to 99.99% w/w, wherein
25 the base polymer comprises one of polybutylene terephthalate (PBT) or polyethylene terephthalate (PET), or polyamides, or polypropylene; and

melting and extruding the mixture of the herbal masterbatch and the base polymer at a temperature in a range of 175°C to 300°C to obtain the polymeric yarn

having the herbal component in a range of 0.01% to 10% on weight of the polymeric yarn.

12. The method of claim 11, wherein preparing the herbal masterbatch comprises:

5 melting a mixture of the herbal component and the carrier polymer at a temperature in a range of 175°C to 300°C to obtain a melted homogeneous mixture of the herbal component and the carrier polymer, wherein the mixture of the herbal component and the carrier polymer comprises: Neem or Turmeric or combination thereof in the range of 1% w/w to 75% w/w, and the carrier polymer having at least
10 one of the polybutylene terephthalate (PBT), or the poly(ethylene terephthalate) (PET), or the polyamides, or polypropylene, wherein the carrier polymer is in the range of 25% w/w to 99% w/w; and

solidifying the melted homogeneous mixture herbal component and the carrier polymer underwater at a temperature in a range of 4°C to 30°C to obtain the
15 herbal masterbatch.

13. The method of claim 12 further comprising:

cabling the polymeric yarn in a range of 40 TPM (Twist Per Meter) to 350TPM to obtain the polymeric yarn with twists, and

heat setting the twists of the polymeric yarn.

20 14. An herbal masterbatch composition for making a polymeric yarn for textile materials, the herbal masterbatch composition comprising:

an herbal component having Neem or Turmeric or combination thereof in a range of 1% w/w to 75% w/w; and

a carrier polymer having at least one of:

25 polybutylene terephthalate (PBT),
polyethylene terephthalate (PET), or
polyamides, or

polypropylene,

wherein the carrier polymer is in a range of 25% w/w to 99% w/w.

15. The herbal masterbatch composition of claim 14, wherein the herbal composition having the Neem or Turmeric or combination thereof in one of a powder form or a liquid form, and where the Neem or Turmeric or combination thereof in the powder form the size of the powder is in a range of 0.001 microns to 25 microns.