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(54) **FLUORESCENT FIBRES AND THEIR USE**

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(56) References cited:
EP-A2- 1 172 417 WO-A1-2007/124521
JP-A- 2 053 908 JP-A- 2008 223 172
US-A- 4 767 807

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EP 2 597 980 B1

Description

[0001] The present invention relates to fluorescent cellulosic regenerated fibres for use in reflective clothing such as are for example described in standard EN 471, EN 1150, CAN/CSA Z96-02, ANSI/ISEA 207-2006 and BS EN 471:2003, their use for the production of yarns and textile fabrics and a process for the production of these fibres.

STATE OF THE ART:

[0002] EN 471 deals exclusively with the reflective effect of personal protective equipment, in particular with reflective clothing. As a rule reflective clothing comprises a fluorescent background material and a retro-reflective material. For the purpose of the present invention, a material is described as a fluorescent material in accordance with the definition in EN 471 which emits rather than absorbs rays at a longer wave length; in the text which follows the term high-visibility material is also used. The present invention refers to the fluorescent background material but not to the retro-reflective materials.

[0003] EN 1150 deals with reflective clothing for non-professional use. The difference between standard EN 1150 in comparison to standard EN 471 is the defined area of the fluorescent material in the clothing. In addition 8 different fluorescent colours are allowed in EN 1150 (in EN 471 only yellow, orange and red fluorescent colours are allowed).

[0004] The CAN/CSA Z96-02 standard is the Canadian standard for high-visibility reflective clothing. The clothing is divided into three categories depending on the application. The demands of the area of the fluorescent material and the colour coordinates after radiation correspond to standard EN 471.

[0005] The American standard ANSI/ISEA 207-2006 defines the requirements for protective clothing depending on the application. I.e. the requirements for protective clothing for the police, rescue forces and construction workers are different. The clothing for these three groups differs in terms of the requirements for the high-visibility background material.

[0006] Until now high-visibility materials were made solely on the basis of synthetic fibres and in particular polyester which, however, has disadvantages with regard to the wear comfort and safety. The disadvantages of textiles of this kind reside in particular in an unpleasant skin climate and in the development of smells after wearing for longer periods due to the insufficient moisture-regulating material properties as well as in the danger typical for synthetic fibres i.e. electrostatic charging. Complex textile structures represent an alternative. In these the outer side contains the high-visibility component and the inner side mainly comprises cellulosic fibres to improve the wear comfort such as are described in WO 2006/017709. Today fibres according to the viscose process and Lyocell process are in particular known as cellulose regenerated fibres. These are used all over the world for standard applications in textile and nonwoven fields with an individual fibre titre of between 0.8 and 15 dtex.

[0007] Cellulosic regenerated fibres can indeed be dyed with fluorescent dyestuffs using the conventional bath process. But the fibres dyed in this way do not satisfy the light fastness requirements (greater than 4, measured according to ISO 105-B02). Following xenon exposure, they are considerably bleached and display a marked change in the colour shade and a considerable reduction in the colour intensity which for example can be depicted as a change in the coordinates of the colour space.

[0008] For decades it has been known that viscose fibres can be dyed in a permanent manner by adding pigments. Corresponding fibres are available on the market. In comparison to spun-dyed synthetic fibres, it has, however, not been possible to date, to produce spun-dyed regenerated fibres which satisfy the requirements of EN 471.

Definition of task:

[0009] Compared to the state of the art, the task was to make a fibre available which on the one hand satisfies the requirements of protective and reflective clothing, as for example are described in EN 471 and CAN/CSA Z96-02, and which on the other hand increases the wear comfort and safety aspects of this clothing with a justifiable economic effort. It should, therefore, be possible to produce the protective and reflective clothing from a fibre of this kind without adding any other fibre types.

[0010] It is particularly important that the textiles made from these fibres pass the following requirements for background materials in accordance with EN 471 (and other standards):

- Minimum light density factor (standard values in accordance with CIE publication no. 15.2) and colour space
- Colour following exposure to xenon: the sample is illuminated according to ISO 105-B02, process 3
- Rub fastness dry and wet (ISO 105-A02)

[0011] Another important criterion is the light fastness of fibres according to ISO 105-B02, process 2

[0012] Moreover, the task was to make a suitable manufacturing process available for these fibres.

SOLUTION:

[0013] Surprisingly it was possible to solve this task with cellulosic regenerated fibres which contain an incorporated fluorescent pigment - in the following also called the "luminous pigment" and a colour pigment incorporated into the spinning dope.

[0014] In this respect for the purpose of the present invention by fluorescent pigment, in particular a fluorescent pigment is to be understood which reveals a separate colour which can be discerned by the human eye in the daylight. If this were not the case, the purpose of the invention - the warning effect - would naturally not be attained. In this respect the pigments would clearly have to differ from purely optical brighteners.

[0015] Surprisingly it was found that as a result of the colour pigment, a clear improvement in the light fastness of the cellulosic regenerated fibres in accordance with the invention can be obtained compared to another fibre which only contains a colour pigment. This is higher than 4, measured according to ISO 105-B02.

[0016] In this respect the necessary high light density factor is attained by the fluorescent pigment. The cellulosic regenerated fibres in accordance with the invention reveal a light density factor, measured according to EN ISO 471 of more than 0.7 for yellow fibres, more than 0.4 for orange fibres and more than 0.25 for red fibres and only slightly changed colour coordinates following xenon test exposure. In the same way they reveal a light density factor, measured according to CAN/CSA Z96-02 of more than 0.38 for fluorescent yellow-green fibres, more than 0.20 for fluorescent orange-red fibres and more than 0.125 for fluorescent red fibres and only a few changed colour coordinates after xenon test exposure.

[0017] The fibres also satisfy the other values demanded by EN 471 and similar norms with regard to rub fastness, perspiration fastness, wash fastness, dry cleaning fastness, hypochlorite bleaching fastness and fastness to ironing.

[0018] The spun-dyed cellulosic regenerated fibres in accordance with the invention can for example be produced according to a viscose process, a modified viscose process (e.g. the Modal process, a zinc-free viscose process with al-sulphate, the polynosic process etc.....) as well as according to a solvent spinning process which is produced with organic solvents such as melted aqueous amine oxides or what are known as ionic liquids. The fibres can be designated accordingly as viscose, Modal, polynosic respectively Lyocell. In the same way other alternative processes such as the Carbatat or the Cupro process are in principle possible.

[0019] Fine spinning was performed at 1.1 - 25, preferably 0.2 - 5.0 weight percentage colour pigment and 0.1 - 22, preferably 7.0 - 17.0 weight percentage of luminous pigment (always in relation to cellulose).

[0020] In general the products known to the expert for the spin dyeing of corresponding fibres are suitable as colour pigments. Among other things the colour pigments Aquamarine Blue 3G from Messrs. Tennants Textile Colors (Cuphalocyanide complexes in the form of chromophores), Aquarine Yellow 10G (Messrs. Tennants Textile Colors, Monoazo dye) and Aquis Orange 0341 (Messrs. Heubach, diarylid pyrazolon dyestuff) are suitable for blue, yellow respectively orange fluorescent fibres.

[0021] The luminous pigments preferably contain amino-modified benzoguanamines as chromophore groups. For example the yellow pigment Lunar Yellow 27 and the orange pigment Blaze 5 from the RTS series of Messrs. Swada are suitable with particle diameters of 3 - 4 μm . These substances are sufficiently stable in spin dyeing conditions i.e. spinning solutions respectively spinning baths with a very high respectively very low pH value or of a high temperature.

[0022] Luminous pigments are basically suitable with other chromophore groups, for example sulfonamide groups, provided that they have the stabilisers named.

[0023] In the case of fluorescent fibres for non-professional use, 8 different colours are allowed such as are described in standard EN 1150. In sports textiles the polyester over dyeing fastness plays an important role for the practical application since many sports textiles are produced from a blend of viscose, Modal or Lyocell with synthetic fibres. If only fluorescent pigments are spun into the cellulosic fibres, the light fastnesses are, also according to this standard, too low. Thus the incorporation of dyestuff pigments in accordance with the invention is also necessary in this case to attain sufficient light fastnesses.

[0024] The light fastnesses of the fibres in accordance with the invention can be further improved by the addition of stabilisers. In principle there are two types of stabilisers which can be used in fluorescent fibres and the efficiency mechanism of which is different.

[0025] In this respect these are UV absorbers and radical quenchers. With the UV absorbers, the light energy is converted into heat and is then drawn off as heat. In chemical terms these substances are either organic, conjugated aromatic compounds (benzophenone, triazine, triazole and oxal-anilide) or anorganic substances (for example nano-ZnO and nano-TiO₂) which have an effect via the mechanism of light dispersion. Radical quenchers are e.g. so-called HALS products (Hindered Amine Light Stabiliser).

[0026] The cellulosic regenerated fibre can contain other additives. In one special embodiment of the invention, the cellulosic regenerated fibre is additionally equipped with a flame-resistant agent.

[0027] One preferred embodiment of the flame-resistant fibre is produced by the additional incorporation of a pigment-shaped flame-resistant agent. In particular organophosphorous compounds come into question as pigment-shaped flame-resistant agents apart from other types. For viscose for example the highly suitable and well-known 2,2'-oxybis

[5,5 dimethyl-1,3,2, dioxaphosphorinan] 2,2' disulfide, available under the trade name of Exolit respectively Sandoflam. In a further preferred embodiment of the invention, the cellulosic regenerated fibre is finished in an antibacterial form. In this respect the expert can use the substances known to him.

[0028] The object of the present invention is also the use of the fibre in accordance with the invention to produce a yarn. To be able to have suitable properties for the respective application, a yarn of this kind in accordance with the invention can also contain fibres of another origin such as for example (flame-resistant) polyester, Modacryl, para- and meta-aramides, polyamidimide (Kermel®), (flame-resistant) wool, polybenzimidazole (PBI), polyimide (P84®), polyamides, (flame-resistant) polyamides, flame-resistant acrylic fibres, melamine fibres, polyphenylsulfide (PPS), polytetrafluorethylene (PTFE), glass fibres, cotton, silk, carbon fibres, oxidised thermally stable polyacrylnitrile fibres (PAN-OX®) and electrically conductive fibres as well as blends of these fibres. In a preferred embodiment of the invention, the blending partners can likewise have a high-visibility finish.

[0029] Likewise the object of the present invention is the use of the fibre in accordance with the invention for the production of a textile fabric. Apart from the fibres in accordance with the invention, this textile can also contain other fibres, for example (flame-resistant) polyester, Modacryl, para- and meta- aramides, polyamidimide (Kermel®), (flame-resistant) wool, polybenzimidazole (PBI), polyimide (P84®), polyamides, (flame-resistant) polyamides, flame-resistant acrylic fibres, melamine fibres, polyphenylsulfide (PPS), polytetrafluorethylene (PTFE), glass fibres, cotton, silk, carbon fibres, oxidised thermally stabilised polyacrylnitrile fibres (PANOX®) and electrically conductive fibres and blends of these fibres. In one preferred embodiment of the invention the other fibres can likewise have a high-visibility finish. The textile fabric is preferably a woven, knitted or warp knitted fabric but can basically also be a fleece (non-woven). In the event of a woven or knit fabric, the blend of the fibres in accordance with the invention is with other fibres either by blending prior to the production of yarns, the so-called intimate blend, or by the joint use of respectively pure yarns of the different fibre types when weaving, knitting or knitting is possible.

[0030] In the same way the object of the present invention is also the use of fibres in accordance with the invention for the production of reflective clothing whereby normally the above named yarns or textile fabrics are intermediate steps within the textile chain. Different designs of articles of clothing of this kind are well known to the expert and do not, therefore, have to be described in greater detail.

[0031] The invention will now be explained on the basis of examples. These are to be understood as possible forms of the embodiment of the invention. In no way is the invention to be restricted to the scope of these examples.

[0032] The colour coordinates and the luminous density factor before and after xenon exposure were measured on a fibre sheet. The fibre sheets are produced in four steps: 10g of fibres are mixed with water, then swirled in a sheet former apparatus in accordance with ISO 3688: 1999 (E) and then finally dewatered. The wet fibre sheet is then finally dried at 92° C for 20 min. The weight per surface area of the fibre sheet obtained in this way equals 285 g/m² and the diameter is 20 cm.

Example 1:

[0033] A spun-dyed viscose fibre 1.7 dtex was produced with a content of 10.5 weight percentage of luminous pigment orange (Messrs. SWADA, RTS series, Blaze 5) and 1.7 weight percentage colour pigment orange Aquis Orange 0341 (Messrs. Heubach, diarylide- pyrazolon (in relation to the cellulose mass)).

[0034] The luminous fibres with the incorporated colour pigments and luminous pigments remain stable following xenon test exposure (table 1). The colour coordinates remain within the given range. The colour density factor drops slightly. The light stability is high and the colour remains intact after washing. The friction fastnesses (dry and wet) comply with the values in the standard. From this we can conclude that these luminous fibres for protective textiles satisfy standard EN 471 in all categories.

Example 2 (comparison):

[0035] A spun-dyed viscose fibre 1.7 dtex contains 12% luminous pigment orange (Messrs. SWADA, RTS series blaze 5) (in relation to the cellulose mass). In this case no colour pigments were used.

[0036] Example 2 shows (table 1) that the luminous fibres, which only contain luminous pigment, with spun-in luminous pigments cannot satisfy standard EN 471 since the colour coordinates lie outside the given range and the light density factor drops significantly following UV exposure. In table 1 the light fastnesses are also given. The measured value of 2 for the light fastness of a fibre in accordance with the state of the art of technology is, therefore, too low to satisfy the standard.

[0037] From the examples provided 1 and 2 it is, therefore, clear that the incorporation of colour pigments together with the luminous pigments is necessary to use the fibres in protective clothing.

Example 3:

[0038] A spun-dyed, flame-resistant viscose fibre with an individual titre of 1.7 dtex contains 21 weight percentage 2,2'-oxybis[5,5-dimethyl-1,3,2-dioxaphosphorinan]2,2'-disulfide (Exolit 5060, Messrs. Clariant), 13.2 % luminous pigment yellow (Lunar Yellow 27, Messrs. SWADA) and 2.6 % colour pigment yellow (Aqurine Yellow 10G of Messrs. Tennants Textile Colors, chromophore groups are Monoazo groups), always in relation to the cellulose. The high-visibility fibres were illuminated in the xenon test and then the colour coordinates were measured before and after the exposure. The fastnesses were determined according to the test process ISO 105-B02.

[0039] The yellow flame-resistant high-visibility fibres reveal excellent results. The light density factor of the flame-resistant high-visibility fibres is extremely high (0.98) and the value remains much higher after exposure (0.81) than is demanded in the standard (0.7 for yellow fibres). The colour coordinates after exposure are almost the same as before exposure which indicates a high-quality luminous fibre. All the fastness tests reveal excellent results which meet all the demands of standard EN ISO 471.

Example 4:

[0040] A spun-dyed viscose fibre with an individual titre of 1.7 dtex was produced with a content of 11.0 weight percentage luminous pigment blue (Cornet blue 60, Messrs. SWADA) and 3.2 weight percentage colour pigment blue (Aqurine Blue 3G, Messrs. Tennants Textile Colors, chromophore groups are Cu-phthalocyanide complexes). The fastnesses are listed in table 1.

[0041] The polyester over dyeing fastness of the blue high-visibility fibres produced in accordance with the invention for non-professional use displays very good values; the colour fastness is > 4 (table 1).

These results confirm that high-visibility cellulose fibres can satisfy the standard EN 1150 and are well suited for clothing for non professional use e.g. leisure sport activities.

Table 1

Example		1	2	3	4
Colour		Orange	Orange	Yellow, FR	Blue
Light density factor	Before exposure	0.47	0.47	0.98	
	After exposure	0.41	0.31	0.81	
Colour coordinates before Exposure	X	0.565	0.537	0.400	
	Y	0.377	0.417	0.528	
Colour coordinates after Exposure	X	0.520	0.423	0.398	
	Y	0.384	0.427	0.488	
Rub fastness	dry ISO 105-A02	4		4	
	Wet	2		2	
Light fastness	ISO 105-B02	4	2	4.5	6
Wash fastness 60 °C ISO 105-C06	Change in colour	5		5	
	Dyeing Viscose	5		5	
	Dyeing Wool	4-5		4-5	
Polyesterwerdyeing	Change in colour	5	4-5		4-5
	Dyeing Viscose	4	2-3		4-5
	Dyeing Polyester	1-2	2		4-5
Perspiration acidic ISO-E04	Change in colour			5	
	Dyeing Viscose			5	
	Dyeing Wool			4-5	

(continued)

Example		1	2	3	4
Perspiration Alkali	Change in colour			5	
	Dyeing Viscose			5	
	Dyeing Wool			4-5	

Claims

1. Cellulosic regenerated fibre which contains an incorporated colour pigment and an incorporated fluorescent pigment discernable by the human eye in daylight and which shows a light fastness of higher than 4, measured according to ISO 105-B02.
2. Cellulosic regenerated fibre according to claim 1 **characterized in that** it contains 0.1 - 25 weight percentage, preferably 0.2 - 5 weight percentage colour pigment and 0.1 - 22 weight percentage preferably 7.0 -17.0 weight percentage of fluorescent pigment, always in relation to the cellulose.
3. Cellulosic regenerated fibre according to claim 1 **characterised in that** the fluorescent pigments contain amino-modified benzoguanamines as the chromophore groups.
4. Cellulosic regenerated fibre according to claim 1 which is produced according to a viscose, Modal, Lyocell, Cupro or carbamate process.
5. Cellulosic regenerated fibre according to claim 1 which contains additional light stabilisers (UV absorber, HALS and anorganic light stabilisers).
6. Cellulosic regenerated fibre according to claim 1 which is in addition finished in a flame-resistant way.
7. Cellulosic regenerated fibre according to claim 6 whereby the flame-resistant agent is an incorporated organophosphorous compound.
8. Cellulosic regenerated fibre according to claim 1 which is in addition finished with an antibacterial agent.
9. Use of fibres according to claims 1 to 8 for the production of a yarn.
10. Use of fibres according to claim 9, wherein the yarn additionally contains fibres of another origin.
11. Use of fibres according to claim 10, wherein the fibres of another origin are chosen from the group consisting of (flame-resistant) polyester, Modacryl, para- and meta-aramides, polyamidimide (Kermel®), (flame-resistant) wool, polybenzimidazole (PBI), polyimide (P84®), polyamides, (flame-resistant) polyamides, flame-resistant acrylic fibres, melamine fibres, polyphenylsulfide (PPS), polytetrafluorethylene (PTFE), glass fibres, cotton, silk, carbon fibres, oxidised thermally stable polyacrylnitrile fibres (PANOX®) and electrically conductive fibres as well as blends of these fibres.
12. Use of fibres according to claims 1 to 8 for the production of a textile fabric.
13. Use of fibres according to claims 12, wherein the textile fabric is a woven, knitted or warp knitted fabric or a non-woven.
14. Use of fibres according to claims 12, wherein the fabric additionally contains fibres of another origin.
15. Use of fibres according to claims 12, wherein the fibres of another origin are chosen from the group consisting of (flame-resistant) polyester, Modacryl, para- and meta-aramides, polyamidimide (Kermel®), (flame-resistant) wool, polybenzimidazole (PBI), polyimide (P84®), polyamides, (flame-resistant) polyamides, flame-resistant acrylic fibres, melamine fibres, polyphenylsulfide (PPS), polytetrafluorethylene (PTFE), glass fibres, cotton, silk, carbon fibres, oxidised thermally stable polyacrylnitrile fibres (PANOX®) and electrically conductive fibres as well as blends of

these fibres.

16. Use of fibres according to claims 1 to 8 for the production of an article of reflective clothing for professional and non-professional use.

Patentansprüche

1. Cellulosische Regeneratfaser, die ein eingesponnenes Farbpigment sowie ein eingesponnenes fluoreszierendes Pigment enthält, welches eine mit dem menschlichen Auge bei Tageslicht wahrnehmbare Eigenfarbe und eine Lichtechtheit von höher als 4, gemessen nach ISO 105-802, aufweist.
2. Cellulosische Regeneratfaser gemäß Anspruch 1, **dadurch gekennzeichnet, dass** sie 0,1-25 Gew.-%, bevorzugt 0,2 - 5,0 Gew.-% Farbpigment und 0,1-22 Gew.-%, bevorzugt 7,0-17,0 Gew.-% fluoreszierendes Pigment, jeweils bezogen auf Cellulose, enthält.
3. Cellulosische Regeneratfaser gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die fluoreszierenden Pigmente als chromophore Gruppen amino-modifizierte Benzoguanamine enthalten.
4. Cellulosische Regeneratfaser gemäß Anspruch 1, die nach einem Viskose-, Modal-, Lyocell-, Cupro- oder Carbatmatverfahren hergestellt wird.
5. Cellulosische Regeneratfaser gemäß Anspruch 1, die zusätzliche Lichtstabilisatoren (UV-Absorber, HALS und anorganische Lichtstabilisatoren) enthält.
6. Cellulosische Regeneratfaser gemäß Anspruch 1, die zusätzlich flammgehemmt ausgerüstet ist.
7. Cellulosische Regeneratfaser gemäß Anspruch 6, wobei die flammhemmende Ausrüstung eine eingesponnene Organophosphorverbindung ist.
8. Cellulosische Regeneratfaser gemäß Anspruch 1, die zusätzlich antibakteriell ausgerüstet ist.
9. Verwendung der Fasern gemäß den Ansprüchen 1 bis 8 zur Herstellung eines Garnes.
10. Verwendung der Fasern gemäß Anspruch 9, wobei das Garn zusätzlich noch Fasern anderer Herkunft enthält.
11. Verwendung der Fasern gemäß Anspruch 10, wobei die Fasern anderer Herkunft beispielsweise (flammgehemmte) Polyester, Modacryl, para- und meta-Aramide, Polyamidimid (Kermel®), (flammgehemmte) Wolle, Polybenzimidazol (PBI), Polyimid (P84®), Polyamide, (flammgehemmte) Polyamide, flammgehemmte Acrylfasern, Melaminfasern, Polyphenylensulfid (PPS), Polytetrafluorethylen (PTFE), Glasfasern, Baumwolle, Seide, Carbonfasern, oxidierte thermisch stabilisierte Polyacrylnitrilfasern (PANOX®) und elektrisch leitfähige Fasern, sowie Mischungen dieser Fasern sind.
12. Verwendung der Fasern gemäß den Ansprüchen 1 bis 8 zur Herstellung eines textilen Flächengebildes.
13. Verwendung der Fasern gemäß Anspruch 12, wobei das textile Flächengebilde ein gewebtes, gewirktes, gestricktes Flächengebilde oder ein Non-Woven ist.
14. Verwendung der Fasern gemäß Anspruch 12, wobei das textile Flächengebilde zusätzlich noch Fasern anderer Herkunft enthält.
15. Verwendung der Fasern gemäß Anspruch 12, wobei die Fasern anderer Herkunft beispielsweise (flammgehemmte) Polyester, Modacryl, para- und meta-Aramide, Polyamidimid (Kermel®), (flammgehemmte) Wolle, Polybenzimidazol (PBI), Polyimid (P84®), Polyamide, (flammgehemmte) Polyamide, flammgehemmte Acrylfasern, Melaminfasern, Polyphenylensulfid (PPS), Polytetrafluorethylen (PTFE), Glasfasern, Baumwolle, Seide, Carbonfasern, oxidierte thermisch stabilisierte Polyacrylnitrilfasern (PANOX®) und elektrisch leitfähige Fasern, sowie Mischungen dieser Fasern sind.

16. Verwendung der Fasern gemäß den Ansprüchen 1 bis 8 zur Herstellung eines Warnbekleidungsstücks für professionellen und nicht-professionellen Gebrauch.

5 Revendications

1. Fibre cellulosique régénérée contenant un pigment coloré intégré, ainsi qu'un pigment fluorescent intégré qui présente une couleur propre perceptible à la lumière du jour par l'oeil humain et une résistance à la lumière supérieure à 4, mesurée selon ISO 105-B02.
2. Fibre cellulosique régénérée selon la revendication 1, **caractérisée en ce qu'elle** contient 0,1 à 25 % en masse, de préférence 0,2 à 5,0 % en masse, de pigment coloré, et 0,1 à 22 % en masse, de préférence 7,0 à 17,0 % en masse, de pigment fluorescent, rapporté respectivement à la cellulose.
3. Fibre cellulosique régénérée selon la revendication 1, **caractérisé en ce que** les pigments fluorescents contiennent comme groupes chromophores des benzoguanamines amino-modifiées.
4. Fibre cellulosique régénérée selon la revendication 1 réalisée selon un procédé viscose, modal, lyocell, cupro ou carbamate.
5. Fibre cellulosique régénérée selon la revendication 1, qui contient des stabilisants à la lumière supplémentaires (absorbeurs UV, HALS et stabilisants à la lumière inorganiques).
6. Fibre cellulosique régénérée selon la revendication 1 avec apprêtage ignifuge supplémentaire.
7. Fibre cellulosique régénérée selon la revendication 6, l'apprêtage ignifuge étant un composé organophosphoré intégré.
8. Fibre cellulosique régénérée selon la revendication 1 avec apprêtage antibactérien supplémentaire.
9. Utilisation des fibres selon les revendications 1 à 8 pour la production d'un fil.
10. Utilisation des fibres selon la revendication 9, le fil contenant en outre des fibres d'origine différente.
11. Utilisation des fibres selon la revendication 10, les fibres d'origine différente étant par exemple du polyester (ignifugé), du modacrylique, du para- et du méta-aramide, du polyamidimide (Kermel®), de la laine (ignifugée), du polybenzimidazole (PBI), du polyimide (P84®), des polyamides, des polyamides (ignifugés), des fibres acryliques ignifugées, des fibres mélamines, du polysulfure de phénylène (PPS), du polytétrafluoroéthylène (PTFE), des fibres de verre, du coton, de la soie, des fibres de carbone, des fibres polyacrylonitriles oxydées stabilisées thermiquement (PA-NOX®) et des fibres électriquement conductrices, ainsi que des mélanges de ces fibres.
12. Utilisation des fibres selon les revendications 1 à 8 pour la fabrication d'un produit textile.
13. Utilisation des fibres selon la revendication 12, le produit textile étant un produit tissé ou à mailles, ou un non-tissé.
14. Utilisation des fibres selon la revendication 12, le produit textile contenant en outre des fibres d'origine différente.
15. Utilisation des fibres selon la revendication 12, les fibres d'origine différente étant par exemple du polyester (ignifugé), du modacrylique, du para- et du méta-aramide, du polyamidimide (Kermel®), de la laine (ignifugée), du polybenzimidazole (PBI), du polyimide (P84®), des polyamides, des polyamides (ignifugés), des fibres acryliques ignifugées, des fibres mélamines, du polysulfure de phénylène (PPS), du polytétrafluoroéthylène (PTFE), des fibres de verre, du coton, de la soie, des fibres de carbone, des fibres polyacrylonitriles oxydées stabilisées thermiquement (PA-NOX®) et des fibres électriquement conductrices, ainsi que des mélanges de ces fibres.
16. Utilisation des fibres selon les revendications 1 à 8 pour la fabrication d'un vêtement de signalisation destiné à une utilisation professionnelle ou non professionnelle.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2006017709 A [0006]