of said textiles. The present invention was developed at least with the aim of addressing this problem and/or with the aim to provide a commercially useful alternative.

Summary

In one aspect of the invention, there is provided a method of recycling cellulose for use as a textile fibre feedstock, the method comprising:

(i) providing a waste textile feedstock comprising greater than 50 wt% cellulose by weight of the waste textile feedstock;

(ii) shredding the waste textile feedstock to provide a shredded waste textile feedstock comprising fibres which have a fibre length of less than 5 mm;

(iii) mixing the shredded waste textile feedstock with an aqueous alkali solution having a pH of greater than 11 to produce a first mixture;

(iv) filtering the first mixture to obtain an alkali treated shredded waste textile feedstock;

(v) mixing the alkali treated shredded waste textile feedstock with an aqueous acid solution having a pH of less than 5 to produce a second mixture; and

(vi) filtering the second mixture to obtain cellulose;

wherein the aqueous alkali solution is a used aqueous alkali solution obtained from the manufacture of viscose process.

In another aspect, there is provided a method of manufacturing viscose or lyocell textile fibres wherein cellulose obtained by the method described herein is used as a textile fibre feedstock.

In yet another aspect, there is provided a use of a used aqueous alkali solution for recycling cellulose, wherein the used aqueous alkali solution is obtained from the manufacture of viscose process.

In a further aspect, there is provided a use of a used aqueous acid solution for recycling cellulose, wherein the used aqueous acid solution is obtained from the manufacture of paper pulp during bleaching process.

Description of the invention

In a first aspect of the present invention, there is provided a method of recycling cellulose for use as a textile fibre feedstock, the method comprising:

(i) providing a waste textile feedstock comprising greater than 50 wt% cellulose by weight of the waste textile feedstock;

(ii) shredding the waste textile feedstock to provide a shredded waste textile feedstock comprising fibres which have a fibre length of less than 5 mm;

(iii) mixing the shredded waste textile feedstock with an aqueous alkali solution having a pH of greater than 11 to produce a first mixture;

(iv) filtering the first mixture to obtain an alkali treated shredded waste textile feedstock;

(v) mixing the alkali treated shredded waste textile feedstock with an aqueous acid solution having a pH of less than 5 to produce a second mixture; and

(vi) filtering the second mixture to obtain cellulose.

The present disclosure will now be described further. In the following passages, different aspects/embodiments of the disclosure are defined in more detail. Each aspect/embodiment so defined may be combined with any other aspect/embodiment or aspects/embodiments unless clearly indicated to the contrary. In particular, any feature indicated as being preferred or advantageous may be combined with any other feature or features indicated as being preferred or advantageous.

The present invention relates to a method of recycling textile waste cellulose. In particular, a method of recycling cellulose to produce cellulose which is then suitable for use as a textile fibre feedstock. The method enables the recycling of cellulose which is present in waste textiles, for example as pure and mixed materials of cotton (e.g. combed and denim), lyocell and viscose fibres / yarn / tow waste (unstretched wrapping fault during regenerate cellulose from spinneret during viscose process). Specifically, the method described herein isolates cellulose from a cellulose-containing material feedstock (i.e. textiles). Isolation of cellulose is also synonymous herein with separating cellulose from the waste textiles or producing cellulose. As described herein, the cellulose remains in the solid state throughout the process and is purified by the treatment described herein to produce the cellulose suitable for re-use a textile fibre feedstock.

The resulting recycled cellulose may be incorporated into standard processes for producing a textile fibre. In particular, the cellulose produced by the method described herein may be used in the viscose process for the production of viscose fibres, a well-known process in the art. The cellulose in the viscose process generally originates from trees where the trees are cut into wood chips and subjected

Claims:

1. A method of recycling cellulose for use as a textile fibre feedstock, the method comprising:

(i) providing a waste textile feedstock comprising greater than 50 wt% cellulose by weight of the waste textile feedstock;

(ii) shredding the waste textile feedstock to provide a shredded waste textile feedstock comprising fibres which have a fibre length of less than 5 mm;

(iii) mixing the shredded waste textile feedstock with an aqueous alkali solution having a pH of greater than 11 to produce a first mixture;

(iv) filtering the first mixture to obtain an alkali treated shredded waste textile feedstock;

(v) mixing the alkali treated shredded waste textile feedstock with an aqueous acid solution having a pH of less than 5 to produce a second mixture; and

(vi) filtering the second mixture to obtain cellulose;

wherein the aqueous alkali solution is a used aqueous alkali solution obtained from the manufacture of viscose process.

2. The method according to claim 1, wherein the waste textile feedstock comprises greater than 70 wt% cellulose, preferably greater than 75 wt% cellulose.

3. The method according to claim 1 or claim 2, wherein the waste textile feedstock further comprises up to 50 wt% of one or more of polyester, polyamide and polyurethane, preferably polyester.

4. The method according to claim 3, wherein the waste textile feedstock comprises up to 30 wt% of one or more of polyester, polyamide and polyurethane, preferably up to 20 wt%, preferably up to 15 wt%, and/or the waste textile feedstock comprises at least 5 wt% of one or more of polyester, polyamide and polyurethane, preferably at least 10 wt%.

5. The method according to any preceding claim, wherein the shredded waste textile feedstock comprises fibres which have a fibre length of less than 3 mm, preferably less than 2 mm, and/or the shredded waste textile feedstock comprises fibres which have a fibre length of at least 1 mm.

6. The method according to any preceding claim, wherein the aqueous alkali solution has a pH of greater than 12, preferably greater than 14.

7. The method according to any preceding claim, wherein the aqueous acid solution has a pH of less than 4 and/or at least 1, preferably at least 2.

8. The method according to any preceding claim, wherein the aqueous alkali solution comprises alkali metal hydroxide, preferably sodium hydroxide and/or potassium hydroxide.

9. The method according to claim 8, wherein the aqueous alkali solution comprises from 50 to 250 g/L of alkali metal hydroxide, preferably from 100 to 240 g/L, preferably from 200 to 230 g/L, preferably from 210 to 220 g/L.

10. The method according to any preceding claim, wherein step (iii) of mixing the shredded waste textile feedstock with the aqueous alkali solution comprises mixing at a temperature of from 75°C to 110°C, preferably from 85°C to 105°C.

11. The method according to any preceding claim, wherein step (iii) of mixing the shredded waste textile feedstock with the aqueous alkali solution is carried out for from 60 to 120 minutes.

12. The method according to any preceding claim, wherein step (v) of mixing the alkali treated shredded waste textile feedstock with the aqueous acid solution is carried out for from 30 to 60 minutes and/or comprises mixing at a temperature of up to 80°C, preferably up to 60°C, and/or at a temperature of at least 30°C.

13. The method according to any preceding claim, wherein the aqueous acid solution comprises an oxidant, preferably wherein the oxidant is one or more selected from the group consisting of hydrogen peroxide, peracetic acid, benzoyl peroxide, ozone, chloramine, chlorine dioxide, and alkali metal salts of peroxide, perborate, percarbonate, persulfate, permanganate, dithionite and hypochlorite, preferably wherein the oxidant is one or more of chlorine dioxide and sodium hypochlorite.

14. The method according to any preceding claim, wherein the method further comprises a step of washing the alkali treated shredded waste textile feedstock, preferably to a pH of from 7 to 8.

15. The method according to any preceding claim, wherein the method further comprises a step of washing the cellulose, preferably to a pH of from 6 to 8.

16. The method according to any preceding claim, wherein the aqueous acid solution is a used aqueous acid solution obtained from the manufacture of paper pulp during bleaching stages.

17. A method of manufacturing viscose or lyocell textile fibres wherein cellulose obtained by the method of any preceding claim is used as a textile fibre feedstock.

18. Use of a used aqueous alkali solution for recycling cellulose, wherein the used aqueous alkali solution is obtained from the manufacture of viscose process.

19. Use of a used aqueous acid solution for recycling cellulose, wherein the used aqueous acid solution is obtained from the manufacture of paper pulp during bleaching process.