because bio-derived polymers are resourced from renewable materials, and there is typically a reduced environmental footprint versus incumbent fibers.

SUMMARY

In an aspect of the disclosure, there is provided a fiber comprising a polymer, wherein the polymer comprises poly(alkylene furandicarboxylate) obtained by polymerization of reaction mixture comprising furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol; and wherein the polymer has a crystallinity of 100 J/g or less, as measured by differential scanning calorimetry; wherein the poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 40,000 as characterized by size exclusion chromatography; and wherein said fiber is prepared by spinning a composition comprising said polymer, characterized in that the highest temperature applied to the polymer during said spinning is in the range of from about 210 °C to about 265 °C.

In an embodiment, the present disclosure relates to a fiber comprising a polymer, wherein the polymer comprises poly(alkylene furandicarboxylate) obtained by polymerization of a reaction mixture comprising a furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol and wherein the polymer has a crystallinity of 100 J/g or less, as measured by differential scanning calorimetry.

In an embodiment, a fiber of the present disclosure is obtained from a polymer composition which is a polymer blend comprising poly(trimethylene-2,5-furandicarboxylate), alternatively referred to herein as PTF, and a second poly(alkylene-furandicarboxylate) that is different from PTF, and wherein the second poly(alkylene-furandicarboxylate) is derived from furan dicarboxylic acid and an aliphatic diol selected from the group consisting of ethylene glycol and C_4 to C_{12} aliphatic diols.

In one embodiment, a fiber of the present disclosure is obtained from a polymer blend comprising PTF and poly(alkylene terephthalate), wherein the poly(alkylene terephthalate) comprises a C_2 to C_{12} aliphatic diol moiety.

In an embodiment, a fiber of the present disclosure is obtained from a copolymer comprising of 2,5-furandicarboxylate, terephthalate and 1,3 propane diol monomer units.

The molar ratio of 2,5-furan dicarboxylic acid to other diacids can be any range, for example the molar ratio can be greater than 1:100 or alternatively in the range of 1:100 to 100 to 1 or 1:9 to 9:1 or 1:3 to 3:1 or 1:1 in which the diol is added at an excess of 1.2 to 3 equivalents to total diacids charged.

In another aspect, the disclosure relates to a yarn comprising the fiber as disclosed above.

In yet another aspect, the disclosure relates to a bicomponent fiber comprising the fiber as disclosed above.

In still another aspect, the disclosure relates to a multifilament fiber comprising the fiber as disclosed above.

In another aspect, the disclosure relates to a fabric or a textile prepared from the fiber as disclosed above.

In a further aspect, there is provided a method of making a fiber comprising:

a. providing a polymer composition comprising poly(alkylene furandicarboxylate) obtained by polymerization of reaction mixture comprising furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol.; and

b. spinning the polymer composition to form fibers, such that the highest temperature applied to the polymer during spinning is in the range of from about 210 °C to about 265 °C; and wherein said poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 40,000 as characterized by size exclusion chromatography.

In an embodiment, there is a method of making a fiber comprising the steps:

a. providing a a polymer composition, wherein the polymer comprises poly(alkylene furandicarboxylate) obtained by polymerization of a reaction mixture comprising a furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol; and

CLAIMS

~~What is claimed is:~~

1. A fiber comprising a polymer, wherein the polymer comprises poly(alkylene furandicarboxylate) obtained by polymerization of reaction mixture comprising furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol; and wherein the polymer has a crystallinity of 100 J/g or less, as measured by differential scanning calorimetry;~~.~~

~~2. The fiber of Claim 1~~ wherein the poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 40,000 as characterized by size exclusion chromatography; and wherein said fiber is prepared by spinning a composition comprising said polymer, characterized in that the highest temperature applied to the polymer during said spinning is in the range of from about 210 °C to about 265 °C.

2. The fiber of Claim 1 wherein the poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 21,000 as characterized by size exclusion chromatography.

3. The fiber of Claim 1 wherein the fiber is oriented.

4. The fiber of Claim 1, wherein the polymer has a crystallinity of 10 J/g or less, as measured by differential scanning calorimetry.

5. The fiber of Claim 1, wherein an aliphatic diol comprises a C_3 diol and the resulting polymer is poly(trimethylene-furandicarboxylate).

6. The fiber of Claim 1, wherein the polymer is a polymer blend comprising (1) poly(trimethylene-2,5-furandicarboxylate) and (2) a second poly(alkylene-furandicarboxylate),

wherein the poly(alkylene-furandicarboxylate) is derived from furan dicarboxylic acid or its functional equivalent and an aliphatic diol selected from the group consisting of ethylene glycol, and C_4, to C_{12}, diols, and wherein the blend comprises 0.1 to about 99.9% by weight of poly(alkylene-furandicarboxylate) based on the total weight of the blend.

7. The fiber of Claim 1, wherein the polymer is a polymer blend comprising (1) poly(trimethylene-2,5-furandicarboxylate) and (2) a second poly(alkylene terephthalate) that is derived from terephthalic acid or its functional equivalent and a C_2 to C_{12} aliphatic diol, and wherein the blend comprises 0.1 to about 99.9% by weight of poly(alkylene terephthalate) based on the total weight of the blend.

8. The fiber of Claim 1, wherein the polymer is a copolymer and the furan dicarboxylic acid is 2,5-furan dicarboxylic acid, and wherein the reaction mixture further comprises (i) at least one other acid selected from the group consisting of dicarboxylic acids, polyfunctional acids and hydroxy acids, or mixtures thereof, and (ii) optionally a polyol, wherein the diol and the optional polyol are present in a combined total molar ratio of at least 1.2:1 relative to the combined total moles of the 2,5-furan dicarboxylic acid and the at least one other acid, and wherein the 2,5-furan dicarboxylic acid is present in a molar ratio of from about 1:100 to about 100:1 relative to the at least one other acid.

9. A yarn comprising the fiber of Claim 1.

10. A bicomponent fiber comprising the fiber of Claim 1.

11. A multifilament fiber comprising the fiber of Claim 1.

12. A fabric or a textile prepared from the fiber of Claim 1.

13. A fabric or textile according to Claim 12 which is woven, knitted or non-woven.

14. A method of making a fiber comprising:

a. providing a polymer composition comprising poly(alkylene furandicarboxylate) obtained by polymerization of reaction mixture comprising furan dicarboxylic acid and a C_2 to C_{12} aliphatic diol.; and

b. spinning the polymer composition to form fibers, such that the highest temperature applied to the polymer during spinning is in

the range of from about 210 °C to about 265 °C; and wherein said poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 40,000 as characterized by size exclusion chromatography.

15. The method of Claim 14, wherein the poly(alkylene furandicarboxylate) has a number average molecular weight (Mn) in the range of from about 10,000 to about 21,000 as characterized by size exclusion chromatography.