less than 1.50. Mention may be made, as such, of processes for transformation by extrusion of pipes or sheets, by extrusion-blow molding of tubes, by injection molding, and also the abovementioned 3D printing processes.

There thus exists a continuous need to be able to reuse these compositions based on polyamides having a high inherent viscosity, in particular those already used in a manufacture but which have not been transformed into final products during the manufacturing process.

The object of the present invention is thus to provide a method for treating compositions based on polyamides having a high inherent viscosity, generally following a transformation process, so that they can be reused as starting materials in desired industrial applications.

More particularly, the aim of the present invention is to provide a method for treating a polyamide-based powder unused on conclusion of a 3D printing process, preferably a process of 3D printing by sintering, in order to be reused as starting material for industrial transformations, for example in an injection molding, extrusion or also 3D printing process.

Summary of the disclosure

According to a first example, a subject matter of the present disclosure is a process for the treatment of a composition (C1) based on polyamides (PA) which is intended to be recycled, comprising the following successive stages:

(i) a stage of supplying a mixture comprising the composition (C1) based on polyamides (PA), a polyamide chain-cutting agent, and optionally one or more filler(s) and/or additive(s);

(ii) a stage of kneading said mixture in the molten state, whereby a composition (C2) having a targeted inherent viscosity is obtained;

(iii) a stage of recovery of the composition (C2).

In one aspect, there present disclosure refers to a process for the treatment of a composition (C1) based on polyamides (PA) which is intended to be recycled, comprising the following successive stages:

(i) a stage of supplying a mixture comprising the composition (C1) based on polyamides (PA), a polyamide chain-cutting agent, and optionally one or more filler(s) and/or additive(s);

(ii) a stage of kneading said mixture in the molten state, whereby a composition (C2) having a targeted inherent viscosity is obtained;

(iii) a stage of recovery of the composition (C2);

where the chain cutting agent is chosen from:

- water,

- a carboxylic acid, where stage (i) is provided with from 0.1% to 2%, by weight of carboxylic acid, with respect to the weight of the composition (C1),

- an amino acid, and/or

their mixture

In the context of the present disclosure, the composition (C1) can be any type of industrial compositions based on polyamides, for example powders, granules, filaments, resins, fibers, films, pipes and/or their mixtures.

Within the meaning of the present disclosure, the term “a composition based on polyamides” is understood to mean a composition having a polyamide matrix,

one example, the process of the disclosure is carried out by means of a “reactive” extruder (with external heating) known to a person skilled in the art. Preferably, the process is carried out in an extruder comprising two conveying screws rotating in a corotating manner.

In another example, a subject matter of the present disclosure is a recycled composition based on polyamides, which is capable of being obtained by the process as defined above, having an inherent viscosity of less than or equal to 1.50, preferably of less than or equal to 1.40, 1.30, 1.25, 1.20, 1.15, 1.10, 1.05, or also less than or equal to 1.00.

The recycled composition on conclusion of the transformation process can be in the form of granules, in the form of a powder, filament, resin, fiber, films or pipe, preferably in the form of granules.

One of the advantages of the present disclosure is that the recycled composition on conclusion of the process according to the disclosure can be usable directly and/or can be easily transformed with the technologies known to a person skilled in the art.

In another example, the disclosure relates to the use of the recycled composition as defined above, preferably in the form of granules, in a transformation process.

According to another example, the disclosure relates to a process of transformation by employing a recycled composition based on polyamides, preferably in the form of granules, as starting material.

The disclosure also relates to an article manufactured according to a process of transformation by employing a recycled composition based on polyamides as is defined above.

By way of example, the composition recovered on conclusion of the process according to the disclosure can be used in coatings, paints, corrosion-resistant compositions, additives for paper, electrophoresis gels, multilayer composite materials, the packaging industry, toys, the textile industry, the automotive industry and/or the electronics industry.

The present disclosure also relates to the use of the recycled composition based on polyamides which is obtained according to the process of the disclosure in a 3D printing process, preferably a process of 3D printing by sintering.

CLAIMS

1. A process for the treatment of a composition (C1) based on polyamides (PA) which is intended to be recycled, comprising the following successive stages:

(i) a stage of supplying a mixture comprising the composition (C1) based on polyamides (PA), a polyamide chain-cutting agent, and optionally one or more filler(s) and/or additive(s);

(ii) a stage of kneading said mixture in the molten state, whereby a composition (C2) having a targeted inherent viscosity is obtained;

(iii) a stage of recovery of the composition (C2);

where the chain cutting agent is chosen from:

- water,

- a carboxylic acid, where stage (i) is provided with from 0.1% to 2%, by weight of carboxylic acid, with respect to the weight of the composition (C1),

- an amino acid, and/or

their mixture.

2. The process as claimed in claim 1, where the composition (C1) is a powder based on polyamides, preferably that which has not been transformed on conclusion of a process of 3D printing by sintering.

3. The process as claimed in claim 1 or 2, where the composition (C1) has an inherent viscosity of greater than or equal to 1.50.

4. The process as claimed in one of the preceding claims, where the inherent viscosity of the recovered composition (C2) is reduced by at least 10%, preferably by at least 20%, with respect to that of the composition (C1).

5. The process as claimed in one of the preceding claims, where the chain-cutting agent is a carboxylic acid, chosen from monocarboxylic acids, dicarboxylic acids, metal salts of mono- or dicarboxylic acids, preferably

chosen from adipic acid, azelaic acid, suberic acid, sebacic acid, dodecanedioic acid, and/or their mixture.

6. The process as claimed in claim 5, where stage (i) is provided with from 0.2% to 0.8%, by weight of carboxylic acid, with respect to the weight of the composition (C1).

7. The process as claimed in one of the preceding claims, where the chain-cutting agent is an amino acid chosen from aminocaproic acid, 7-aminoheptanoic acid, 11-aminoundecanoic acid, 12-aminododecanoic acid, and/or their mixture.

8. The process as claimed in claim 7, where stage (i) is provided with from 0.1% to 10%, preferably from 0.2% to 8%, for example from 1% to 7%, by weight of amino acid, with respect to the weight of the composition (C1).

9. The process as claimed in claim 1, where a temperature greater by at least 5°C, preferably greater by at least 10°C, with respect to the melting point of polyamides (PA), and below 330°C, is applied in the kneading stage (ii).

10. The process as claimed in one of the preceding claims is a batch process.

11. The process as claimed in one of the preceding claims is a continuous process.

12. The process as claimed in one of the preceding claims, where the residence time of the mixture in stage (ii) is equal to or less than 10 minutes, preferably less than 5 minutes, or less than 3 minutes.

13. The process as claimed in one of the preceding claims, where the polyamide (PA) is chosen from a homopolyamide, a copolyamide, a copolymer having polyamide blocks and polyether blocks, and their blends.

14. The process as claimed in claim 13, where the polyamide (PA) comprises at least one polyamide or one polyamide block chosen from polyamides and copolyamides comprising at least one of the following monomers: 46, 4T, 54, 59, 510, 512, 513, 514, 516, 518, 536, 6, 64, 66, 69, 610, 612, 613, 614, 616, 618, 636, 6T, 9, 104, 109, 1010, 1012, 1013, 1014, 1016,

1018, 1036, 10T, 11, 12, 124, 129, 1210, 1212, 1213, 1214, 1216, 1218, 1236, 12T, MXD6, MXD10, MXD12, MXD14, and their blends.