

Working with this in mind, the applicant has developed a method making it possible to obtain a TPU meeting these expectations.

The TPU obtained according to the method which is a subject of the present invention also has the advantage of being partly obtained from a raw material of natural origin. Indeed, in the current context of the gradual decrease in petroleum product resources, it is increasingly advantageous to replace products of petroleum origin with products of natural origin.

Thus, in one aspect, the present invention relates to a method for preparing TPU pellets by reactive extrusion, comprising:

- introducing, into an extruder, a macrodiol (a) of molar mass from 500 to 3000 g/mol, a diisocyanate (b), at least one chain extender (c) comprising a dianhydrohexitol and a polymerization catalyst (d), said compounds (a), (b), (c) and (d) being introduced into the extruder in liquid form;
- mixing the compounds (a), (b), (c) and (d) and polymerizing said mixture in the extruder; and
- extruding and cutting the polymerized mixture to form the thermoplastic polyurethane pellets.

The macrodiol (a) according to the present invention denotes a polymer functionalized at chain ends by hydroxyl functions. The macrodiol has a molecular weight of between 500 and 3000 g/mol, preferably of between 700 and 2000 g/mol, more preferentially of between 800 and 1500 g/mol. The macrodiol is preferably chosen from polyether glycols, polyester glycols, polycarbonate glycols or mixtures thereof. In a particular embodiment, the macrodiol is a polyether glycol. The functionality of the macrodiol is between 1.75 and 2.2, preferably between 1.85 and 2.1, more preferentially between 1.95 and 2.05. Within the meaning of the present invention, "functionality" is intended to mean the total number of reactive hydroxyl functions per mole of polyol.

Polyether glycols or polyalkylene ether glycols denote preferably linear polyethers having two terminal hydroxyl functions. The alkylene portion may comprise 2 to 10 carbon atoms, preferably 2 to 4 carbon atoms. They may be obtained by reaction of a glycol with an epoxide. The polyether glycols according to the present invention comprise block or random copolyether glycols, especially block or random copolymers of ethylene oxide and propylene oxide. Examples of polyether glycols according to the present invention comprise poly(oxyethylene) glycol, poly(oxypropylene) glycol, poly(oxyethylene-oxypropylene) glycol, poly(oxytetramethylene) glycol (also referred to as

greater than the highest melting point of these compounds, to enable homogeneous mixing and polymerization, but also than the glass transition temperature of the TPU formed, to enable the extrusion thereof. Thus, too low a temperature may prolong the time needed for polymerization and reduce the extrusion rate. Conversely, too high a temperature may increase the fluidity of the TPU
5 formed and pose problems for extrusion and pelletization. The temperature profile generally varies between 150 and 280°C, preferably between 200 and 250°C.

The residence time of the mixture in the extruder may vary as a function of the reactivity of the compounds and the reaction conditions used. The residence time is generally less than 10 minutes, preferably less than 5 minutes, more preferentially between 30 seconds and 3 minutes.
10 These residence times are advantageous since they are compatible with an industrial method. In addition, a reduced residence time advantageously makes it possible to reduce the energy consumption of the method and to increase the production rate.

The TPU formed in this way is extruded through a die to give a rod which is then cut to obtain the TPU pellets according to the invention. The TPU rod may be cooled in a water bath before being
15 cut into pellets.

The method according to the invention also advantageously comprises a step of drying the TPU pellets. The drying may be carried out in an oven or any other device well known to those skilled in the art suitable for drying polymer pellets. This step also has the advantage of stopping the polymerization reaction, if required.

For some applications, additives may be added to the TPU pellets in order to modify their appearance or their properties, especially their color, their opacity, their mechanical strength, their electrical properties, etc. These additives are generally added during a step of mixing, especially by extrusion, subsequent to the method according to the invention. However, such additives may be added during the method according to the invention, as long as they do not adversely affect the
20 polymerization. Thus, these additives are preferably added after the mixing and polymerization step. These additives, which are well known to those skilled in the art, may be for example heat stabilizers, hydrolytic scission stabilizers, processing aids, pigments, dyes, fillers or fibers.

In another aspect, the present invention relates to the TPU pellets obtained by the process described above.

The TPU pellets according to the invention have the advantage of having low coloration. In particular, the TPUs according to the invention have a more neutral hue than those of the TPUs obtained conventionally by reactive extrusion, using especially 1,4-butanediol as chain extender. By
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