Claims

1. A fixed and/or stabilized fiber structure from a fibrous material and an agent for its fixing and stabilizing,
characterized in that the agent for fixing and stabilizing is at least one statistical copolyester which is formed from the following components:

from 55 to 100 mol% terephthalic acid;
from 0 to 45 mol% isophthalic acid;
from 35 to 75 mol% butanediol:
from 15 to 35 mol% diethylene glycol;
from 10 to 30 mol% triethylene glycol,

wherein the sum of the molar fractions of terephthalic acid and butanediol is a maximum of 150 mol% with respect to the total diacid and total diol quantities of 100 mol% each.

2. A fiber structure in accordance with claim 1, characterized in that the at least one statistical copolyester is formed from the following components:

from 70 to 100 mol%, preferably from 85 to 100 mol% terephthalic acid,
from 0 to 30 mol%, preferably from 0 to 15 mol% isophthalic acid;
of 45 to 65 mol%, preferably from 47 to 57 mol% butanediol;
from 20 to 30 mol%, preferably from 23 to 28 mol% diethylene glycol;
from 15 to 25 mol%, preferably from 20 to 25 mol% triethylene glycol,

wherein the sum of the molar fractions of terephthalic acid and butanediol is a maximum of 150 mol% with respect to the total diacid and total diol quantities of 100 mol% each.

3. A fiber structure in accordance with one of the preceding claims, characterized in that the at least one statistical copolyester contains 0 to 2% by weight, preferably 0.05 to 1% by weight additives, in particular nucleation agents, stabilizers, lubricants, antifoaming agents, condensation catalysts, with the sum of copolyester and additives producing 100% by weight.

4. A fiber structure in accordance with one of the preceding claims, characterized in that the at least one copolyester has a melting viscosity, measured according to ISO/DIN 1133, at 160°C and a load of 2.16 kg, in the range of 100 to 3000 Pas, preferably of 100 to 600 Pas, particularly preferably of 120 to 500 Pas, and very particularly preferably from 150 to 300 Pas.

5. A fiber structure in accordance with one of the claims 1 to 3, characterized in that the at least one copolyester is present as a fixing thread and has a melting viscosity, measured according to ISO/DIN 1133, at 160°C and a load of 2.16 kg, in the range of 1000 to 3000 Pas, preferably of 1500 to 2500 Pas, and particularly preferably of 1700 to 2200 Pas.

6. A fiber structure in accordance with one of the preceding claims, characterized in that the at least one copolyester has a melting point, measured according to ISO 11357 at a heating rate of 20 K/min, in the range of 60 to 160°C, preferably of 70 to 150°C, and particularly preferably of 90 to 140°C.

7. A fiber structure in accordance with one of the preceding claims, characterized in that the fibrous material is a unidirectional filament or an areal fibrous material from the group of fabrics, fleeces, knitted meshes or knitted fabrics, nonwovens or combinations hereof.

8. A fiber structure in accordance with one of the preceding claims, characterized in that the fibrous materials are selected from the group comprising

- glass fibers,
- carbon fibers,
- mineral fibers,
- synthetic fibers, in particular polymer fibers, preferably of polyesters and polyamides, in particular of polyaramides,
- natural fibers, in particular cotton, wool, kapok, hemp, linen, jute or wood as well as
- mixtures hereof.

9. A method of manufacturing a fiber structure in accordance with one of the preceding claims in which the at least one agent for fixing and stabilizing the fibrous material is applied to the fibrous material by powder point coating, paste point coating or scatter coating or as a paste, suspension, film, web, nonwoven, fixed nonwoven or woven fabric or sprayed melt and a fixing of the fiber structure subsequently takes place by the effect of temperature and/or pressure.

10. A method of manufacturing a fiber structure in accordance with one of the claims 1 to 8, wherein the fixing and stabilizing of the fibrous material takes place by sewing with fixing threads manufactured from the at least one statistical copolyester.

11. A fiber-resin composite material containing at least one thermosetting resin as well as at least one fiber structure in accordance with one of the claims 1 to 8.

12. A fiber-resin composite material in accordance with claim 10, characterized in that the at least one thermosetting resin is an epoxy resin.

13. A fiber-resin composite material in accordance with claim 10 or claim 11, characterized in that the fiber-resin composite material has a strength in the interlaminar shear strength test of at least 55 MPa, preferably of at least 60 MPa, at a measuring temperature of 23°C.

14. A fiber-resin composite material in accordance with claims 10 to 12, characterized in that the fiber-resin composite material has a compression after impact in the test of the compression after impact (CIA) of at least 185 MPa, preferably of at least 210 MPa, and particularly preferably of at least 245 MPa.

15. Use of the fiber structure in accordance with one of the preceding claims as a reinforcement material for epoxy resins, in particular in the areas of sports/leisure, machine industry, electronics, construction, medical engineering, means of traffic and transport, and aerospace engineering.

Claims

1. A fiber-resin composite material containing at least one thermosetting resin as well as a fixed and/or stabilized fiber structure from a fibrous material being selected from the group comprising

- glass fibers,
- carbon fibers,
- mineral fibers,
- synthetic fibers,
- mixtures hereof,

and an agent for its fixing and stabilizing, characterized in that the agent for fixing and stabilizing is at least one statistical copolyester which is formed from the following components:

from 55 to 100 mol% terephthalic acid;

from 0 to 45 mol% isophthalic acid;

from 35 to 75 mol% butanediol:

from 15 to 35 mol% diethylene glycol;

from 10 to 30 mol% triethylene glycol,

wherein the sum of the molarfractions of terephthalic acid and butanediol is a maximum of 150 mol% with respect to the total diacid and total diol quantities of 100 mol% each.

2. A fiber-resin composite material in accordance with claim 1, characterized in that the at least one statistical copolyester is formed from the following components:

from 70 to 100 mol%, preferably from 85 to 100 mol% terephthalic acid,

from 0 to 30 mol%, preferably from 0 to 15 mol% isophthalic acid;

of 45 to 65 mol%, preferably from 47 to 57 mol% butanediol;

from 20 to 30 mol%, preferably from 23 to 28 mol% diethylene glycol;

from 15 to 25 mol%, preferably from 20 to 25 mol% triethylene glycol,

wherein the sum of the molar fractions of terephthalic acid and butanediol is a maximum of 150 mol% with respect to the total diacid and total diol quantities of 100 mol% each.

3. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the at least one statistical copolyester contains 0 to 2% by weight, preferably 0.05 to 1% by weight additives, in particular nucleation agents, stabilizers, lubricants, antifoaming agents, condensation catalysts, with the sum of copolyester and additives producing 100% by weight.

4. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the at least one copolyester has a melting viscosity, measured according to ISO/DIN 1133, at 160°C and a load of 2.16 kg, in the range of 100 to 3000 Pas, preferably of 100 to 600 Pas, particularly preferably of 120 to 500 Pas, and very particularly preferably from 150 to 300 Pas.

5. A fiber-resin composite material in accordance with one of the claims 1 to 3, characterized in that the at least one copolyester is present as a fixing thread and has a melting viscosity, measured according to ISO/DIN 1133, at 160°C and a load of 2.16 kg, in the range of 1000 to 3000 Pas, preferably of 1500 to 2500 Pas, and particularly preferably of 1700 to 2200 Pas.

6. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the at least one copolyester has a melting point, measured according to ISO 11357 at a heating rate of 20 K/min, in the range of 60 to 160°C, preferably of 70 to 150°C, and particularly preferably of 90 to 140°C.

7. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the fibrous material is a unidirectional

filament or an areal fibrous material from the group of fabrics, fleeces, knitted meshes or knitted fabrics, nonwovens or combinations hereof.

8. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the fibrous materials are selected from the group comprising polymer fibers, preferably polyester and polyamides, more preferably polyamides.

9. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the at least one thermosetting resin is an epoxy resin.

10. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the fiber-resin composite material has a strength in the interlaminar shear strength test of at least 55 MPa, preferably of at least 60 MPa, at a measuring temperature of 23°C.

11. A fiber-resin composite material in accordance with one of the preceding claims, characterized in that the fiber-resin composite material has a compression after impact in the test of the compression after impact (CIA) of at least 185 MPa, preferably of at least 210 MPa, and particularly preferably of at least 245 MPa.

12. A fiber-resin composite material in accordance with one of the preceding claims , characterized in that the fiber-resin composite material is applicable in the areas of sports, leisure, machine industry, electronics, construction, medical engineering, means of traffic and transport, and aerospace engineering.

13. A method of manufacturing a fiber-resin composite material in accordance with one of the preceding claims in which the at least one agent for fixing and stabilizing the fibrous material is applied to the fibrous material by powder point coating, paste point coating or scatter coating or as a paste, suspension, film, web, nonwoven, fixed nonwoven or woven fabric or sprayed melt and a fixing of the fiber-resin composite

material subsequently takes place by the effect of temperature and/or pressure.