Claims

1. Process for the preparation of a masterbatch comprising the steps of:
   a) providing carbon nanotubes,
   b) providing a first semi-crystalline polymer having a melting temperature Tm1 as measured according to ISO11357-3, wherein the first semi-crystalline polymer is selected from syndiotactic polypropylene and isotactic polypropylene, and preferably wherein said first semi-crystalline polymer has a melt flow index comprised between 5 and 250 g / 10 min measured according to ISO1133 under a load of 2.16 kg;
   c) blending together said carbon nanotubes and said first semi-crystalline polymer by extrusion in an extruder comprising a transport zone and a melting zone ranges from 155°Cto 185°C, and
   d) forming a masterbatch through a die, said masterbatch,
      - comprising at least 5 wt% of carbon nanotubes based on the total weight of the masterbatch as determined according to ISO11358, and
      - having a high load melt index HLMI of from 100 g/ 10 min to 1000 g/ 10 min as determined under a load of 21.6 kg according to ISO1133.

2. Process according to claim 1 characterized in that the temperature in the transport zone and the melting zone of the extruder ranges from 155°C to 175°C.

3. Process for the preparation of a masterbatch comprising the steps of:
   a. providing carbon nanotubes,
   b. providing a first semi-crystalline polymer having a melting temperature Tm1 as measured according to ISO11357-3, wherein the first semi-crystalline polymer is polyethylene, and preferably wherein said first semi-crystalline polymer has a melt flow index comprised between 5 and 250 g/ 10 min measured according to ISO1133 under a load of 2.16 kg;
   c. blending together said carbon nanotubes and said first semi-crystalline polymer by extrusion in an extruder comprising a transport zone and a melting zone maintained at a temperature comprised between 140°C to 180°C, and
   d. forming a masterbatch through a die, said masterbatch,
      - comprising at least 5wt% of carbon nanotubes based on the total weight of the masterbatch as determined according to ISO11358, and
      - having a high load melt index HLMI of from 10 g / 10 min to 100 g / 10 min as determined under a load of 21.6 kg according to ISO1133.

4. Process according to claim 3 characterized in that the first semi-crystalline polymer is polyethylene, in that the temperature in the transport zone and the melting zone of the extruder ranges from 150°C to 160°C.

5. Process according to claim 1 to 4 characterized in that:

- the process further comprises the step of blending from 0.01 to 4.0 wt% of one or more additives based on the total weight of the masterbatch with the first semicrystalline polymer and carbon nanotubes in step (c), said one or more additives being selected from waxes, tristearin, zinc stearate, calcium stearate, magnesium stearate, erucyl amide, oleic acid amide, ethylene-acrylic acid copolymer, ethylene vinyl acetate copolymer and cetyl trimethyl ammonium bromide; and/or in that
- step (c) of blending together said carbon nanotubes and said first semi-crystalline polymer, is carried out on co-rotating twin screw extruder at a screw speed of at least 300 rpm.

6. Masterbatch produced by the process according to anyone of claims 1, 2 or 5, for use in a process of preparing a composite material, the masterbatch comprising a blend of a first semi-crystalline polymer having a melting temperature Tm1 as measured according to ISO11357-3, with carbon nanotubes, wherein the carbon nanotubes content being of at least 5 wt% of carbon nanotubes based on the total weight of the masterbatch as determined according to ISO11358, characterized in that said masterbatch has a high load melt index HLMI ranging from 100 g/10 min to 1000 g/10 min as determined according to ISO1133 under a load of 21.6 kg; and in that the first semi-crystalline polymer is selected from syndiotactic polypropylene and isotactic polypropylene.

7. Masterbatch produced by the process according to anyone of claims 3 to 5, for use in a process of preparing a composite material, the masterbatch comprising a blend of a first semi-crystalline polymer having a melting temperature Tm1 as measured according to ISO11357-3, with carbon nanotubes, wherein the carbon nanotubes content being of at least 5 wt% of carbon nanotubes based on the total weight of the masterbatch as determined according to ISO11358, characterised in that said masterbatch has a high load melt index HLMI ranging from 10 g/10 min to 100 g/10 min as determined according to ISO1133 under a load of 21.6 kg; and in that the first semi-crystalline polymer is polyethylene.

8. Masterbatch according to claim 6 or 7, characterised in that the first semi-crystalline polymer has a melt flow index ranging from 5 to 250 g/10 min as measured according to ISO1133 under a load of 2.16 kg.

9. Masterbatch according to any one of claims 6 to 8, characterised in that the masterbatch comprises from 0.01 to 4.0 wt% of one or more additives based on the total weight of the masterbatch, said one or more additives being selected from waxes, tristearin, zinc stearate, calcium stearate, magnesium stearate, erucyl amide, oleic acid amide, ethyleneacrylic acid copolymer, ethylene vinyl acetate copolymer and cetyl trimethyl ammonium bromide.

10. Composite material consisting of a semi-crystalline polymer and carbon nanotubes in an amount ranging from 0.25 to 2.5 wt%, preferably from 0.8 to 1.3 wt% based on the

total weight of the composite material as determined according to ISO 11358, characterized in that the composite material has a surface resistivity lower than 10^5 ohm/sq, more preferably lower than 10^4 ohm/sq as determined according to CEI60167, and has an agglomerate area fraction U% lower than 2.0 % preferably lower than 1 % as determined in accordance with ASTM D-2663-14, wherein the semi-crystalline polymer is selected from polyethylene, syndiotactic polypropylene and isotactic polypropylene.

11. Process for the preparation of a composite material comprising the steps of:
    a) providing a masterbatch comprising a blend of a first semi-crystalline polymer having a melting temperature Tm1 as measured according to ISO11357-3, with carbon nanotubes, and prepared with a process according to any one of claims 5 to 9,
    b) providing a second semi-crystalline polymer wherein the second semi-crystalline polymer is selected to be miscible with the first semi-crystalline polymer, to have a melting temperature Tm2 ranging from Tm1 - 25°C to Tm1 +25°C and has a melt flow index lower of not more than 100 g / 10 min, preferably not more than 20 g/10 min as determined according to ISO1133;
    c) blending together said masterbatch and said second semi-crystalline polymer by extrusion in an extruder comprising a transport zone and a melting zone maintained at a temperature greater than 180°C,
    d) forming a composite material through a die.

12. The process according to claim 11 characterized in that the second semi-crystalline polymer is selected from polyethylene, syndiotactic polypropylene, isotactic polypropylene, polylactic acid, polyamide, ethyl-vinyl acetate, polyurethane, polyetheretherketone, polyoxymethylene, syndiotactic polystyrene (SPS), polyphenylene sulfide (PPS), liquid crystalline polymer (LCP), polybutene, or polyhexene; preferably the second semi-crystalline polymer is selected from polyethylene, syndiotactic polypropylene, isotactic polypropylene and polylactic acid; more preferably the second semi-crystalline polymer is selected from polyethylene, syndiotactic polypropylene and isotactic polypropylene.

13. Article made of a composite material according to claim 10.

14. A rotomoulded article made from a composite material according to claim 10, preferably the composite material comprises from 0.5 wt% to 0.7 wt%, more preferably of 0.6 wt%, of carbon nanotubes based on the total weight of the composite material as determined according to ISO11358.