CLAIMS

1. Process for treating a plastic feedstock comprising polyolefins, the process, comprising:
   a) a dissolution step involving placing the plastic feedstock in contact with a dissolution solvent comprising a hydrocarbon containing between 3 and 12 carbon atoms, at a dissolution temperature of between 100°C and 300°C and a dissolution pressure of between 1.0 and 20.0 MPa abs to obtain at least one crude polymer solution;

   b) a step of extraction by placing the crude polymer solution obtained from step a) in contact with an extraction solvent comprising a hydrocarbon containing between 3 and 12 carbon atoms, at a temperature of between 100°C and 300°C, a pressure of between 1.0 and 20.0 MPa abs and at a mass ratio between the mass flow rate of the extraction solvent and the mass flow rate of the crude polymer solution of between 0.05 and 20.0, to obtain at least one extracted polymer solution and one spent solvent; and then

   c) a step of recovering the polymers, to obtain at least one solvent fraction and one fraction of purified polyolefins.

2. Process according to Claim 1, in which the dissolution solvent is chosen from organic solvents with a boiling point of between -50°C and 250°C, preferably between -15°C and 150°C, preferably between 20°C and 110°C.

3. Process according to Claim 1 or 2, in which the dissolution solvent has a critical temperature of between 90 and 400°C, preferably between 130 and 300°C and preferably between 180 and 290°C, and a critical pressure of between 1.5 and 5.0 MPa, preferably between 2.0 and 4.3 MPa and preferably between 2.4 and 4.2 MPa.

4. Process according to one of the preceding claims, in which the dissolution temperature in step a) is between 150 and 250°C and the dissolution pressure is between 1.5 and 15.0 MPa abs and very preferably between 2.0 and 10.0 MPa abs.

5. Process according to one of the preceding claims, in which the extraction solvent used in step b) is a hydrocarbon, which has a critical temperature of between 90 and 400°C, preferably between 130 and 300°C and preferably between 180 and 290°C, and a critical pressure of between 1.5 and 5.0 MPa abs, preferably between 2.0 and 4.3 MPa abs and preferably between 2.4 and 4.2 MPa abs.

6. Process according to one of the preceding claims, in which the extraction solvent is the same as the dissolution solvent, optionally in a different physical state.

7. Process according to one of the preceding claims, in which, in step b), the extraction is performed by placing the crude polymer solution obtained from step a) in contact with an extraction solvent which is at least partly, preferably totally, in supercritical form.

8. Process according to Claim 7, in which the extraction solvent is a pentane isomer, a hexane isomer or a heptane isomer.

9. Process according to Claim 7 or 8, in which the extraction step a b) is performed at a temperature of between 150°C and 300°C, preferably between 180°C and 280°C, and at a pressure preferably between 2.0 and 20.0 MPa abs, preferably between 2.0 and 15.0 MPa abs and very preferably between 3.0 and 10.0 MPa abs.

10. Process according to one of the preceding claims, in which the polymer recovery step c) includes a solvent recovery section at a temperature of between 0 and 350°C, preferably between 5 and 300°C and preferably between 10 and 250°C, and at a pressure of between 0.1 and 20.0 MPa abs, preferably between 0.1 and 15.0 MPa abs and very preferably between 0.1 and 10.0 MPa abs.

11. Process according to one of the preceding claims, in which the polymer recovery step c) includes at least one solvent recovery section under temperature and pressure conditions adjusted so as to be under supercritical conditions of the dissolution solvent.

12. Process according to one of the preceding claims, comprising a step E1) of separating out the insoluble matter by solid-liquid separation, situated between the dissolution step a) and the extraction step b), and operated at a temperature of between 100°C and 300°C, a pressure of between 1.0 and 20.0 MPa abs, preferably including an electrostatic separator and/or a filter and/or a sand filter.

13. Process according to one of the preceding claims, comprising a step E2) of washing with a dense solution, situated between the dissolution step a) and the extraction step b), and operated at a temperature of between 100°C and 300°C, a pressure of between 1.0 and 20.0 MPa abs, the dense solution having a density of greater than or equal to 0.85, preferably greater than or equal to 0.9, preferentially greater than or equal to 1.0, the dense solution very preferably being an aqueous solution.

14. Process according to one of the preceding claims, comprising an adsorption step E3) situated between the dissolution step a) and the polymer recovery step c) and including an adsorption section operated in the presence of at least one adsorbent, at a temperature of between 100 and 300°C and a pressure of between 1.0 and 20.0 MPa abs.

15. Process according to one of the preceding claims, comprising:
    a) a dissolution step involving placing the plastic feedstock in contact with a dissolution solvent comprising a hydrocarbon containing between 3 and 12 carbon atoms, at a dissolution temperature of between 100°C and 300°C and a dissolution pressure of between 1.0 and 20.0 MPa abs, to obtain at least one crude polymer solution;

    E1) a step of separating out the insoluble matter by solid-liquid separation, at a temperature of between 100°C and 300°C and at a pressure of between 1.0 and 20.0 MPa abs, said step E1) being fed with the crude polymer solution obtained from step a), to obtain at least one clarified polymer solution and one insoluble fraction;

    b) a step of extraction by placing the clarified polymer solution obtained from step E1) in contact with an extraction solvent comprising a hydrocarbon containing between 3

and 12 carbon atoms, at a temperature of between 100 and 300°C, at a pressure of between 1.0 and 20.0 MPa abs and at a mass ratio between the mass flow rate of the extraction solvent and the mass flow rate of the clarified polymer solution of between 0.05 and 20.0, to obtain at least one extracted polymer solution and one spent solvent; and then

c) a polymer recovery step, to obtain at least one solvent fraction and one fraction of purified polyolefins, said polymer recovery step preferably including at least one solvent recovery section under temperature and pressure conditions adjusted so as to be under supercritical conditions of the dissolution solvent.