CLAIMS

1. Process for treating a plastic feedstock, comprising:

    a) a dissolution step involving placing the plastic feedstock in contact with a dissolution solvent comprising a hydrocarbon, at a dissolution temperature of between 150°C and 250°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 washing by placing the crude polymer solution obtained from step a) in contact with a dense solution having a density of greater than or equal to 0.85, at a temperature of between 150°C and 250°C, a pressure of between 1.0 and 20.0 MPa abs and at a mass ratio between the mass flow rate of the dense solution and the mass flow rate of the crude polymer solution which feeds step b) of between 0.05 and 20.0, to obtain at least one washed polymer solution and one washing effluent; and then

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

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 abs, preferably between 2.0 and 4.3 MPa abs and preferably between 2.4 and 4.2 MPa abs.

4. Process according to one of the preceding claims, in which the dissolution pressure in step a) 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 dense solution used in step b) has a density of greater than or equal to 0.9, preferentially greater than or equal to 1.0.

6. Process according to one of the preceding claims, in which the dense solution used in step b) is an aqueous solution, which preferably comprises at least 50% by weight of water, preferably at least 75% by weight of water, preferably at least 90% by weight of water, very preferably at least 95% by weight of water.

7. Process according to one of the preceding claims, in which the washing step b) is performed at the dissolution temperature and the dissolution pressure.

8. 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.

9. 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.

10. Process according to one of the preceding claims, comprising a step E2) of extraction by placing the washed polymer solution in contact with an extraction solvent, 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 washed polymer solution of between 0.05 and 20.0, in which the extraction solvent is preferably an organic solvent 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, to obtain at least one extracted polymer solution and one spent solvent.

11. Process according to Claim 10, in which the extraction solvent is the same as the dissolution solvent and is at least partly, preferably totally, in supercritical form.

12. Process according to one of the preceding claims, comprising a step E1) of separating out the insoluble matter by solid-liquid separation, at a temperature of between 100°C and 300°C, a pressure of between 1.0 and 20.0 MPa abs, said step E1) being situated between the dissolution step a) and the polymer recovery step c), and upstream or downstream of the washing step b), preferably upstream of the washing step b), and in which the step E1) of separating out the insoluble matter preferably includes an electrostatic separator and/or a filter and/or a sand filter.

13. Process according to one of the preceding claims, comprising a step E3) of adsorption 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.

14. 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, at a dissolution temperature of between 150°C and 250°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 washing by placing the crude polymer solution obtained from step a) in contact with a dense solution having a density of greater than or equal to 0.85, at a temperature of between 150°C and 250°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 dense solution and the mass flow rate of the crude polymer solution of between 0.05 and 20.0, said dense solution preferably being an aqueous solution, to obtain at least one washed polymer solution and one washing effluent;

E2) a step of extraction by placing the washed polymer solution obtained from step b) in contact with an extraction solvent, at a temperature of between 100°C 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 washed 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 purified polymer fraction, 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.

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, at a dissolution temperature of between 150°C and 250°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 washing by placing the crude polymer solution obtained from step a) in contact with a dense solution having a density of greater than or equal to 0.85, at a temperature of between 150°C and 250°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 dense solution and the mass flow rate of the crude polymer solution of between 0.05 and 20.0, said dense solution preferably being an aqueous solution, to obtain at least one washed polymer solution and one washing effluent;

E3) an adsorption step fed with the washed polymer solution obtained from step b) and including an adsorption section operated in the presence of at

least one adsorbent, at a temperature of between 100°C and 300°C and a pressure of between 1.0 and 20.0 MPa abs, to obtain at least one refined polymer solution; and then

c) a polymer recovery step, to obtain at least one solvent fraction and one purified polymer fraction, 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.