Patent Claims

1. Process for the preparation of homopolymers or block copolymers of vinyl aromatic monomers by anionic polymerization comprising the following steps:
   (i) polymerization of at least one vinyl aromatic monomer and optionally at least one conjugated diene in an inert non-polar solvent in the presence of an organometal initiator, in particular organolithium initiator, in a reactor, preferably a batch reactor, and subsequent deactivation of the obtained “living” polymer chains with a terminating agent to obtain a polymer solution;
   (ii) passing the polymer solution obtained in step (i) through a first filter;
   (iii) feeding the polymer solution obtained in step (ii) to a dispersing device to which water is added in a continuous or in a discontinuous mode;
   (iv) feeding the polymer solution obtained in step (iii) to a buffer vessel;
   (v) feeding the continuously withdrawn polymer solution from the buffer vessel into a static mixer for impregnation by addition of further water, carbon dioxide and one or more stabilizers; wherein

   subsequent to step (iv), the process is conducted in a continuous mode;

   in step (ii):
   - no water is present in the first filter;
   - the first filter, preferably a bagfilter, has a mesh size of 200 to 1500 µm;
   - the flow rate of the polymer solution is 10 to 500 m^3/h at a temperature of from 50 to 130°C;

   in step (iii):
   - the dispersion device is a second filter, preferably a bagfilter, having a mesh size of 200 to 1500 µm, a static mixer or a process flow part in which the characteristic length of the process flow part, the velocity, the density and the dynamic viscosity of the polymer solution are chosen in such a way that a transitional or turbulent flow with a Reynolds number above 2300 occurs;
   - water is added in amounts of 0.01 to 0.50 l/m^3 polymer solution, polymer solution;

   in step (v):

- the flow rate of the additional water is more than 0.05 l/m³ polymer solution, preferably more than 0.10 l/m³ polymer solution, and
- the flow rate of the carbon dioxide is more than 5 l/m³ polymer solution, preferred 10 to 20 l/m³ polymer solution, more preferred 14.5 to 17.5 l/m³ polymer solution; and

in steps (iii) and (v), the pH of the water is in the range of from 5 to 7, preferably 6.2 to 6.6.

2. Process according to claim 1, wherein the reactor is a batch reactor.

3. Process according to claim 1 or 2, wherein in step (iii), the dispersing device is a filter.

4. Process according to claim 1, wherein in step (iii), the dispersing device is a process flow part, specifically a tube or pipe, in which the polymer solution has a transitional flow with a Reynolds number between 2300 and 4000.

5. Process according to any of claim 1, 2 or 4, wherein in step (iii) the dispersing device is a process tube having a characteristic length of from 0.05 to 1.0 m, and the polymer solution has a velocity of from 1.0 to 10.0 m/s, density of from 750 to 900 kg/m³, and a dynamic viscosity of from 0.01 to 10 Ns/m² at a temperature of from 60 to 80 °C.

6. Process according to any of claim 1, 2 or 4, wherein in step (iii) the dispersing device is a process tube having a characteristic length of from 0.05 to 5 m, and the polymer solution has a velocity of from 1.0 to 10.0 m/s, density of from 750 to 900 kg/m³, and a dynamic viscosity of from 0.01 to 10 Ns/m² at a temperature of from 60 to 95°C.

7. Process according to any of claims 1 to 6, wherein in steps (ii) and (iii), the filter is a bagfilter.

8. Process according to any of claims 1 to 7, wherein in step (ii), the mesh size of the filter is 500 to 1000 µm, in particular 700 to 900 µm.

9. Process according to any of claims 1 to 8, wherein in step (iii), the water is added in amounts of 0.05 to 0.20 l/m³ polymer solution, more preferably 0.05 to 0.15 l/m³ polymer solution.

10. Process according to any of claims 1 to 9, wherein the polymer solution obtained in step (v) is fed to a further buffer vessel.

11. Process according to any of claims 1 to 10, wherein prior to step (v) - the polymer solution continuously withdrawn from the buffer vessel is filtered by a third filter.

12. Process according to claim 11, wherein the third filter is a cartridge filter with a mesh size between 50 µm and 300 µm, preferably between 100 µm and 150 µm.

13. Process according to any of claims 1 to 12, wherein in step (v), the stabilizers are added as a solution with a flow rate of 1 to 8 l/m³ polymer solution, in particular 3.5 to 4.5 l/m³ polymer solution.

14. Process according to any of claims 1 to 13, wherein in step (v) the stabilizers are dissolved in a nonpolar solvent where the concentration of each of the one or more stabilizers is in the range of from 3.5 to 15 wt.-%, preferably 5 to 12 wt.-%.

15. Process according to any of claims 1 to 14, wherein in step (v), a plasticizer, preferably mineral oil, is added with an injection flow of 0.1 to 30 l/m³ polymer solution, in particular 0.5 to 15 l/m³ polymer solution.