Patent claims

1. High-molecular-weight, linear, neodymium-catalysed polybutadiene having a high proportion, >95%, of cis-1,4 units and having a low proportion, <1%, of 1,2-vinyl content, and also having a small molar-mass-distribution index (MDI), characterized in that

   - Mooney viscosity (ML $_{1+4}$ 100°C) of the polybutadiene is from 70 to 90 and
   - the molar-mass-distribution index of the polybutadiene is smaller than 10.

2. Polybutadiene according to Claim 1, characterized in that the solution viscosity (RT, 5.43%, toluene) is from 350 to 630 mPas, preferably from 400 to 580 mPas.

3. Polybutadiene according to Claim 2, characterized in that the branching index (BI) is from 5 to 7.

4. Polybutadiene according to Claim 3, characterized in that its Mooney relaxation after 30 sec (ML-Relax 30sec) is smaller than 6%.

5. Polybutadiene according to Claim 4, characterized in that its molar-mass distribution is Mw 90% < 1 000 000 g/mol and Mw 10% > 100 000 g/mol.

6. Process for producing high-molecular-weight, neodymium-catalysed polybutadienes according to any of the preceding claims, encompassing the following steps:

   1) modified catalyst production using a preformation process, with use of catalyst systems based on neodymium, composed of

      component A: an alcoholate or a carboxylate of neodymium, preferably neodymium versatate,

      component B: a dialkylaluminium hydride, preferably diisobutylaluminium hydride (DIBAH),

      component C: a trialkylaluminium compound, preferably tributylaluminium,

      component D: a diene, preferably butadiene or isoprene, and

      component E: at least one organometallic halide, preferably ethylaluminium sesquichloride (EASC),

      where, in a first step, components A, B, C and D are firstly mixed at a temperature of from 0°C to 80°C, preferably from 30°C to 60°C, for a period of

from 5 minutes to 10 hours, preferably from 20 minutes to 2 hours, and the mixture is then cooled to below -10°C, preferably to below -30°C, prior to addition of component E;

2) a process of preformation of the modified catalyst system at a temperature of from -30°C to 80 C, preferably from 5°C to 50°C, for a period of from 1 to 250 hours, preferably from 2 to 100 hours;

3) polymerization of the monomers at a temperature of from -20 to 150°C.

7. Process according to Claim 6, characterized in that component D is preferably a monomer identical with that used for producing high-molecular-weight neodymium-catalysed polybutadienes.

8. Process according to Claim 7, characterized in that the molar ratio of component A to component B is from 1:1 to 1:100, preferably from 1:3 to 1:80 and particularly preferably from 1:3 to 1:50, the molar ratio of component A to component C is from 1:0.4 to 1:15, preferably from 1:0.5 to 1:8, the molar ratio of component A to component D is from 1:1 to 1:200, preferably from 1:2 to 1:100 and particularly preferably from 1:3 to 1:50, and the molar ratio of component A to component E is from 1:0.5 to 1:20, preferably from 1:0.7 to 1:10 and particularly preferably from 1:0.8 to 1:8.

9. Rubber mixtures comprising a polybutadiene according to Claim 5.

10. Use of the rubber mixtures according to Claim 9 for producing mouldings of any type.

11. Use according to Claim 10, characterized in that the moulding is a tyre component.

12. Use of the rubber mixture according to Claim 9 for impact-modifying thermoplastics.

13. Use of the rubber mixtures according to Claim 9 for polystyrene and styrene/acrylonitrile copolymers.

14. Use of the rubber mixtures according to Claim 9 for golf balls.

Claims

1. High-molecular-weight, linear, neodymium-catalysed polybutadiene having a high proportion, >95%, of cis-1,4 units and having a low proportion, <1%, of 1,2-vinyl content, and also having a small molar-mass-distribution index MDI, characterized in that

   - Mooney viscosity at ML_{1+4} 100°C of the polybutadiene is from 70 to 90 and

   - the molar-mass-distribution index of the polybutadiene is smaller than 10 which is the quotient obtained by dividing Mw (90%) by Mw (10%) wherein its molar-mass distribution is Mw 90% < 1 000 000 g/mol and Mw 10% > 100 000 g/mol.

2. Polybutadiene according to Claim 1, characterized in that a solution viscosity of the polybutadiene at RT at 5.43%, toluene is from 350 to 630 mPas,

3. Polybutadiene according to Claim 1, characterized in that a solution viscosity of the polybutadiene at RT at 5.43%, toluene is from 400 to 580 mPas.

4. Polybutadiene according to Claim 2 or 3, characterized in that the branching index (BI) is from 5 to 7.

5. Polybutadiene according to Claim 4, characterized in that its Mooney relaxation after 30 sec is smaller than 6%.

6. Process for producing high-molecular-weight, neodymium-catalysed polybutadienes according to any of the preceding claims, encompassing the following steps:

   1) modified catalyst production using a preformation process, with use of catalyst systems based on neodymium, composed of

      component A: an alcoholate or a carboxylate of neodymium, preferably neodymium versatate,

      component B: a dialkylaluminium hydride, preferably diisobutylaluminium hydride (DIBAH),

      component C: a trialkylaluminium compound, preferably tributylaluminium,

      component D: a diene, preferably butadiene or isoprene, and

      component E: at least one organometallic halide, preferably ethylaluminium sesquichloride (EASC),

where, in a first step, components A, B, C and D are firstly mixed at a temperature of from 0°C to 80°C, preferably from 30°C to 60°C, for a period of from 5 minutes to 10 hours, preferably from 20 minutes to 2 hours, and the mixture is then cooled to below -10°C, preferably to below -30°C, prior to addition of component E;

2) a process of preformation of the modified catalyst system at a temperature of from -30°C to 80°C, preferably from 5°C to 50°C, for a period of from 1 to 250 hours, preferably from 2 to 100 hours;

3) polymerization of the monomers at a temperature of from -20 to 150°C.

7. Process according to Claim 6, characterized in that component D is preferably a monomer identical with that used for producing high-molecular-weight neodymium-catalysed polybutadienes.

8. Process according to Claim 7, characterized in that the molar ratio of component A to component B is from 1:1 to 1:100, preferably from 1:3 to 1:80 and particularly preferably from 1:3 to 1:50, the molar ratio of component A to component C is from 1:0.4 to 1:15, preferably from 1:0.5 to 1:8, the molar ratio of component A to component D is from 1:1 to 1:200, preferably from 1:2 to 1:100 and particularly preferably from 1:3 to 1:50, and the molar ratio of component A to component E is from 1:0.5 to 1:20, preferably from 1:0.7 to 1:10 and particularly preferably from 1:0.8 to 1:8.

9. Rubber mixtures comprising a polybutadiene according to Claim 5.

10. Use of the rubber mixtures according to Claim 9 for producing mouldings of any type.

11. Use according to Claim 10, characterized in that the moulding is a tyre component.

12. Use of the rubber mixture according to Claim 9 for impact-modifying thermoplastics.

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