Molding compositions comprising metal oxides are described by way of example in EP-A-0 853 995.

The better the flowability of the filled polyoxymethylene homo- or copolymer compositions, the finer the structures that can be developed in the molding. On the other hand, the metal particles or ceramic particles have to be capable of homogeneous transportation with the molding composition. A suitable property profile involving flowability and creep compliance is often achieved by using POM with a weight-average molar mass starting at about 85 000 g/mol.
The flowability of the POM could be improved by reducing molecular weight, or flow improvers could be added. A flow improver here should have very good miscibility with POM and exhibit rapid decomposition in an acid-gas atmosphere, in order to avoid defects in the desired moldings.

EP-A-0 446 708 describes the addition of aliphatic polyurethanes, of aliphatic uncrosslinked polyepoxides, of aliphatic polyamides or polyacrylates, or of poly(C_{2-6}-alkylene oxides) to give polyoxymethylene homo- or copolymers.

It is an object of the emodiments of the present disclosure to provide thermoplastic molding compositions which are based on polyoxymethylene homo- or copolymers with improved flowability and which, when charged with inorganic powders in the extrusion process or in the injection-molding process exhibit better flow behavior than known molding compositions, and which at the same time retain the good mechanical properties of the known molding compositions based on polyoxymethylene homo- or copolymers.

In a first aspect, there is provided a thermoplastic composition comprising

from 10 to 90% by weight of a polyoxymethylene homo- or copolymer with a weight-average molar mass (M_W) in the range from 50 000 to 400 000 g/mol as component B1 and

from 10 to 90% by weight of a polyoxymethylene copolymer with a weight-average molar weight (M_W) in the range from 5000 to 15 000 g/mol as component B2 derived to an extent of at least 90% by weight, based on the polymer, from trioxane and butanediol formal as monomers, with a proportion of butanediol formal, based on the polymer, in the range from 0.5 to 4% by weight, preferably from 2 to 3.5% by weight, in particular 2.5 to 3% by weight, wherein the polyoxymethylene copolymer is prepared in the presence of 0.5 to 4% by weight of butylal as regulator and the chain ends have, based on the polymer, from 3 to 6 % by weight of moieties of the general formula -OR, where R is C_{1-6}-alkyl ~~an alkyl based on butylal~~.

Claims

1. A thermoplastic composition comprising

from 10 to 90% by weight of a polyoxymethylene homo- or copolymer with a weight-average molar mass (M_W) in the range from 50 000 to 400 000 g/mol as component B1 and

from 10 to 90% by weight of a polyoxymethylene copolymer with a weight-average molar weight (M_W) in the range from 5000 to 15 000 g/mol as component B2 derived to an extent of at least 90% by weight, based on the polymer, from trioxane and butanediol formal as monomers, with a proportion of butanediol formal, based on the polymer, in the range from 0.5 to 4% by weight, preferably from 2 to 3.5% by weight, in particular 2.5 to 3% by weight, wherein the polyoxymethylene copolymer is prepared in the presence of 0.5 to 4% by weight of butylal as regulator and the chain ends have, based on the polymer, from 3 to 6 % by weight of moieties of the general formula -OR, where R is C_{1-6}-alkyl~~an alkyl based on butylal~~.

2. The composition according to claim 1, wherein the weight-average molar mass (M_W) of component B2 is from 6000 to 9000 g/mol, preferably from 6500 to 8000 g/mol, in particular from 7000 to 7500 g/mol, and that of component B1 is from 70 000 to 300 000 g/mol, preferably from 95 000 to 210 000 g/mol.

3. The composition according to claim 1, wherein the number-average molar mass (M_n) of component B2 is from 3000 to 6000 g/mol, preferably from 3200 to 5000 g/mol, in particular from 3500 to 4100 g/mol.

4. The composition according to any of claims 1 to 3, wherein the ratio M_W/M_n for component B2 is in the range from 1.5 to 3.0, preferably from 1.5 to 2.45.

5. The composition according to any of claims 1 to 4, wherein at least 90% by weight of component B1, based on the polymer, derive from trioxane and optionally butanediol formal as monomers, preferably from trioxane and butanediol formal as monomers, with a proportion of butanediol formal, based on the polymer, in the range from 1 to 5% by weight, preferably from 2 to 3.5% by weight, in particular from 2.5 to 3% by weight.

6. A process for producing thermoplastic compositions according to any of claims 1 to 5 by separate production of components B1 and B2 in each case by polymerizing trioxane and optionally comonomers in the presence of at least one cationic initiator and of butylal as regulator, and then mixing components B1 and B2.

7. A process for producing flowable polyoxymethylene copolymers by separate production of components B1 and B2, these being as defined in any of claims 1 to 5, respectively by polymerizing trioxane and optionally comonomers in the presence of at least one cationic initiator and of butylal as regulator, and then mixing components B1 and B2 at a temperature in the range from 150 to 220°C under a pressure in the range from 0.5 to 5 bar.

8. A molding composition for producing inorganic moldings, comprising, based on the total volume of the molding composition,

from 20 to 70% by volume of a sinterable pulverulent inorganic material selected from metals, metal alloys, metal carbonyls, metal oxides, metal carbides, metal nitrides, and mixtures thereof, as component A,

from 30 to 80% by volume of a thermoplastic composition according to any of claims 1 to 65, as component B, and

from 0 to 5% by volume of a lubricant and/or dispersing agent as component C,

where the total volume of components A to C gives 100% by volume.

9. The molding composition according to claim 8, wherein the particle size of at least 65% by volume of component A is at most 5 µm and the particle size of the remainder of component A is at most 10 µm.

10. A process for producing a molding composition according to claim 8 or 9 by melting component B at a temperature in the range from 150 to 220°C to obtain a melt stream and metering components A and optionally C into the melt stream of component B.

11. The use of the molding composition according to claim 8 or 9 for producing metallic or ceramic moldings.

12. A process for producing metallic or ceramic moldings by injection molding or extruding a molding composition according to claim 8 or 9 to give a green product, then removing binder from the green product to give a brown product, and then sintering the brown product.