Claims

1. A chemical molding comprising a zeolitic material which exhibits a type I nitrogen adsorption/desorption isotherm and which has framework type MFI and a framework structure comprising Si, O, and Ti,
the molding further comprising a binder for said zeolitic material, the binder comprising Si and O,
wherein the molding exhibits a total pore volume of at least 0.4 mL/g and a crushing strength of at least 6 N.

2. The molding of claim 1, wherein from 95 to 100 weight-%, preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-%, more preferably from least 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the zeolitic material comprised in the molding consist of Si, O, Ti and optionally H, and wherein the zeolitic material comprises Ti in an amount in the range of from 0.2 to 5 weight-%, preferably in the range of from 0.5 to 4 weight-%, more preferably in the range of from 1.0 to 3 weight-%, more preferably in the range of from 1.2 to 2.5 weight-%, more preferably in the range of from 1.4 to 2.2 weight-%, calculated as elemental Ti and based on the total weight of the zeolitic material, wherein the zeolitic material comprised in the molding is preferably titanium silicalite-1.

3. The molding of claim 1 or 2, wherein from 95 to 100 weight-%, preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-%, more preferably from at least 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the binder comprised in the molding consist of Si and O, and wherein the molding comprises the binder, calculated as SiO_2, in an amount in the range of from 2 to 90 weight-%, preferably in the range of from 5 to 70 weight-%, more preferably in the range of from 10 to 50 weight-%, more preferably in the range of from 15 to 30 weight-%, more preferably in the range of from 20 to 25 weight-%, based on the total weight of the molding.

4. The molding of any one of claims 1 to 3, wherein from 95 to 100 weight-%, preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-%, more preferably from least 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the molding consist of the zeolitic material and the binder.

5. The molding of any one of claims 1 to 4, exhibiting a total pore volume in the range of from 0.4 to 1.5 mL/g, preferably in the range of from 0.4 to 1.2 mL/g, more preferably in the range of from 0.4 to 1.0 mL/g, and exhibiting a crushing strength in the range of from 6 to 25 N, preferably in the range of from 7 to 20 N, more preferably in the range of from 8 to 15 N.

6. The molding of any one of claims 1 to 5, exhibiting one or more of the following characteristics:

- a tortuosity parameter relative to water in the range of from 1.0 to 2.5, preferably in the range of from 1.3 to 2.0, more preferably in the range of from 1.6 to 1.8, more preferably in the range of from 1.6 to 1.75, more preferably in the range of from 1.6 to 1.72, determined as described in Reference Example 11;
- a BET specific surface area in the range of from 300 to 450 m²/g, preferably in the range of from 310 to 400 m²/g, more preferably in the range of from 320 to 375 m²/g, determined as described in Reference Example 6;
- a crystallinity in the range of from 50 to 100 %, preferably in the range of from 50 to 90 %, more preferably in the range of from 50 to 80 %, determined as described in Reference Example 7;
- a propylene oxide activity of at least 4.5 weight-%, preferably in the range of from 4.5 to 11 weight-%, more preferably in the range of from 4.5 to 10 weight-%, determined as described in Reference Example 9;
- a pressure drop rate in the range of from 0.005 to 0.019 bar(abs)/min, preferably in the range of from 0.006 to 0.017 bar(abs)/min, more preferably in the range of from 0.007 to 0.015 bar(abs)/min, determined as described in Reference Example 9;
- a hydrogen peroxide conversion in the range of from 90 to 95 % when used as catalyst in a reaction for preparing propylene oxide from propene and hydrogen peroxide, determined in a continuous epoxidation reaction as described in Reference Example 10 at a temperature of the cooling medium in the range of from 55 to 56 °C at a time on stream in the range of from 200 to 600 hours, preferably at a time on stream in the range of from 300 to 600 hours, more preferably at a time on stream in the range of from 350 to 600 hours, wherein the term “time on stream” refers to the duration of the continuous epoxidation reaction without regeneration of the catalyst.

7. The molding of any one of claims 1 to 6, obtainable or obtained by a process according to any one of claims 8 to 16.

~~7~~8. A process for preparing a chemical molding according to any one of claims 1 to 6 comprising a zeolitic material which exhibits a type I nitrogen adsorption/desorption isotherm determined as described in Reference Example 1, and which has framework type MFI and a framework structure comprising Si, O, and Ti,
the molding further comprising a binder for said zeolitic material, the binder comprising Si and O, ~~preferably for preparing a chemical molding according to any one of claims 1 to 6,~~ the process comprising

(i) providing a zeolitic material exhibiting a type I nitrogen adsorption/desorption isotherm determined as described in Reference Example 1, having framework type MFI and a framework structure comprising Si, O, and Ti;

(ii) providing a binder precursor comprising a colloidal dispersion of silica in water, said binder precursor exhibiting a volume-based particle size distribution characterized by a Dv10 value of at least 35 nanometer, a Dv50 value of at least 45 nanometer, and a Dv90 value of at least 65 nanometer, determined as described in Reference Example 5;

(iii) preparing a mixture comprising the zeolitic material provided in (i) and the binder precursor provided in (ii);

(iv) shaping the mixture obtained from (iii), obtaining a precursor of the molding;

(v) preparing a mixture comprising the precursor of the molding obtained from (iv) and water, and subjecting the mixture to a water treatment under hydrothermal conditions, obtaining a water-treated precursor of the molding;

(vi) calcining the water-treated precursor of the molding in a gas atmosphere, obtaining the molding.

~~8~~9. The process of claim ~~7~~8, wherein the volume-based particle size distribution of the colloidal dispersion of silica in water according to (ii) is characterized by a Dv10 value in the range of from 35 to 80 nanometer, preferably in the range of from 40 to 75 nanometer, more preferably in the range of from 45 to 70 nanometer, a Dv50 value in the range of from 45 to 125 nanometer, preferably in the range of from 55 to 115 nanometer, more preferably in the range of from 65 to 105 nanometer, and a Dv90 value in the range of from 65 to 200 nanometer, preferably in the range of from 85 to 180 nanometer, more preferably in the range of from 95 to 160 nanometer, determined as described in Reference Example 5, wherein preferably from 95 to 100 weight-%, more preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-% of the binder precursor according to (ii) consist of the colloidal dispersion of silica in water.

~~9~~10. The process of claim ~~7~~ 8 or ~~8~~9, wherein in the mixture prepared according to (iii) and subjected to (iv), the weight ratio of the zeolitic material, relative to the sum of the zeolitic material and the binder calculated as SiO_2, is in the range of from 2 to 90 %, preferably in the range of from 5 to 70 %, more preferably in the range of from 10 to 50 %, more preferably in the range of from 15 to 30 %, more preferably in the range of from 20 to 25 %, wherein the mixture prepared according to (iii) and subjected to (iv) preferably further comprises one or more additives, preferably one or more viscosity modifying agents, or one or more mesopore forming agents, or one or more viscosity modifying agents and one or more

mesopore forming agents, wherein the one or more additives are preferably selected from the group consisting of water, alcohols, organic polymers, and mixtures of two or more thereof, wherein the organic polymers are preferably selected from the group consisting of celluloses, cellulose derivatives, starches, polyalkylene oxides, polystyrenes, polyacrylates, polymethacrylates, polyolefins, polyamides, polyesters, and mixtures of two or more thereof, wherein the organic polymers are more preferably selected from the group consisting of cellulose ethers, polyalkylene oxides, polystyrenes, and mixtures of two or more thereof, wherein the organic polymers are more preferably selected from the group consisting of a methyl celluloses, carboxymethyl celluloses, polyethylene oxides, polystyrenes, and mixtures of two or more thereof, wherein more preferably, the one or more additives comprise, more preferably consist of, water, a carboxymethyl cellulose, a polyethylene oxide, and a polystyrene.

~~10~~11. The process of claim ~~9~~10, wherein in the mixture prepared according to (iii) and subjected to (iv)

- the weight ratio of the zeolitic material, relative to the one or more additives, is in the range of from 0.3:1 to 1:1, preferably in the range of from 0.4:1 to 0.8:1, more preferably in the range of from 0.5:1 to 0.6:1;
- the weight ratio of the zeolitic material, relative to the cellulose derivative, preferably the cellulose ether, more preferably the carboxymethyl cellulose, is in the range of from 10:1 to 53:1, preferably in the range of from 15:1 to 40:1, more preferably in the range of from 20:1 to 35:1;
- the weight ratio of the zeolitic material, relative to the polyethylene oxide, is in the range of from 70:1 to 110:1, preferably in the range of from 75:1 to 100:1, more preferably in the range of from 77:1 to 98:1;
- the weight ratio of the zeolitic material, relative to the polystyrene, is in the range of from 2:1 to 8:1, preferably in the range of from 3:1 to 6:1, more preferably in the range of from 3.5:1 to 5:1;
- the weight ratio of the zeolitic material, relative to the water, is in the range of from 0.7:1 to 0.85:1, preferably in the range of from 0.72:1 to 0.8:1, more preferably in the range of from 0.74:1 to .0.79:1;

wherein the mixture obtained from (iii) and subjected to (iv) preferably has a plasticity in the range of from 500 to 3000 N, more preferably in the range of from 750 to 2000 N, more preferably in the range of from 1000 to 1500 N, determined as described in Reference Example 12.

~~11~~12. The process of any one of claims ~~7~~ 8 to ~~10~~11, wherein shaping according to (iv) further comprises drying the precursor of the molding in a gas atmosphere, wherein said drying is preferably carried out at a temperature of the gas atmosphere in the range of from 80 to 160 °C, preferably in the range of from 100 to 140 °C, more preferably in the range of from 110 to 130 °C, wherein the gas atmosphere preferably comprises nitrogen, oxygen, or a mixture thereof, wherein the gas atmosphere is more preferably oxygen, air, or lean air, and wherein shaping according to (iv) further comprises calcining the dried precursor of the molding in a gas atmosphere, wherein calcining is preferably carried out

at a temperature of the gas atmosphere in the range of from 450 to 530 °C, preferably in the range of from 470 to 510 °C, more preferably in the range of from 480 to 500 °C, wherein the gas atmosphere comprises preferably nitrogen, oxygen, or a mixture thereof, wherein the gas atmosphere is more preferably oxygen, air, or lean air.

~~12~~13. The process of any one of claims ~~7~~ 8 to ~~11~~12, wherein in the mixture prepared in (v), the weight ratio of the precursor of the molding relative to the water is in the range of from 1:1 to 1:30, preferably in the range of from 1:5 to 1:25, more preferably in the range of from 1:10 to 1:20, wherein preferably from 95 to 100 weight-%, more preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-%, more preferably from 99.5 to 100 weight-%, more preferably from 99.9 to 100 weight-% of the mixture prepared according to (v) consist of the precursor of the molding and water.

~~13~~14. The process of any one of claims ~~7~~ 8 to ~~12~~13, wherein the water treatment according to (v) comprises a temperature of the mixture in the range of from 100 to 200 °C, preferably in the range of from 125 to 175 °C, more preferably in the range of from 130 to 160 °C, more preferably in the range of from 135 to 155 °C more preferably in the range of from 140 to 150 °C, wherein the water treatment according to (v) is carried out under autogenous pressure, preferably in an autoclave.

~~14~~15. The process of any one of claims ~~7~~ 8 to ~~13~~14, wherein (v) further comprises separating the water-treated precursor of the molding from the mixture obtained from the water treatment, said separating preferably comprising subjecting the mixture obtained from the water treatment to solid-liquid separation, preferably washing the separated precursor, and preferably drying the preferably washed precursor, wherein said drying according to (v) preferably comprises drying the precursor in a gas atmosphere, wherein drying is preferably carried out at a temperature of the gas atmosphere in the range of from 80 to 160 °C, more preferably in the range of from 100 to 140 °C, more preferably in the range of from 110 to 130 °C, wherein the gas atmosphere preferably comprises nitrogen, oxygen, or a mixture thereof, wherein the gas atmosphere is more preferably oxygen, air or lean air.

~~15~~16. The process of any one of claims ~~7~~ 8 to ~~14~~15, wherein calcining according to (vi) is carried out at a temperature of the gas atmosphere in the range of from 400 to 490 °C, preferably in the range of from 420 to 470 °C, more preferably in the range of from 440 to 460 °C, wherein the gas atmosphere preferably comprises nitrogen, oxygen, or a mixture thereof, wherein the gas atmosphere is more preferably oxygen, air or lean air.

~~16. A chemical molding comprising particles of a zeolitic material exhibiting a type I nitrogen adsorption/desorption isotherm determined as described in Reference Example 1, having framework type MFI and a framework structure comprising Si, O, and Ti, the molding further comprising a binder for said particles, the binder comprising Si and O, preferably the chemical molding according to any one of claims 1 to 6, obtainable or obtained by a process according to any one of claims 7 to 15.~~

17. Use of a molding according to any one of claims 1 to 7 ~~1 to 6 or according to claim 16~~ as an adsorbent, an absorbent, a catalyst or a catalyst component, preferably as a catalyst or as a catalyst component, more preferably as a Lewis acid catalyst or a Lewis acid catalyst component, as an isomerization catalyst or as an isomerization catalyst component, as an oxidation catalyst or as an oxidation catalyst component, as an aldol condensation catalyst or as an aldol condensation catalyst component, or as a Prins reaction catalyst or as a Prins reaction catalyst component, preferbaly as an oxidation catalyst or as an oxidation catalyst component, preferably as an epoxidation catalyst or as an epoxidation catalyst component, more preferably as an epoxidation catalyst, preferably for the epoxidation reaction of an organic compound having at least one C-C double bond, preferably a C2-C10 alkene, more preferably a C2-C5 alkene, more preferably a C2-C4 alkene, more preferably a C2 or C3 alkene, more preferably propene, more preferably for the epoxidation of propene with hydrogen peroxide as oxidizing agent, more preferably for the epoxidation of propene with hydrogen peroxide as oxidizing agent in a solvent comprising an alcohol, preferably methanol.

18~~.~~. Use of a colloidal dispersion of silica in water as a binder precursor for preparing a chemical molding according to any one of claims 1 to 6 comprising a zeolitic material which exhibits a type I nitrogen adsorption/desorption isotherm determined as described in Reference Example 1, and which has framework type MFI and a framework structure comprising Si, O, and Ti, the molding further comprising a binder resulting from said binder precursor, ~~preferably for preparing a molding according to any one of claims 1 to 6,~~ said silica exhibiting a volume-based particle size distribution characterized by a Dv10 value of at least 35 nanometer, preferably in the range of from 35 to 80 nanometer, more preferably in the range of from 40 to 75 nanometer, more preferably in the range of from 45 to 70 nanometer, a Dv50 value of at least 45 nanometer, preferably in the range of from 45 to 125 nanometer, more preferably in the range of from 55 to 115 nanometer, more preferably in the range of from 65 to 105 nanometer, and a Dv90 value of at least 65 nanometer, preferably in the range of from 65 to 200 nanometer, more preferably in the range of from 85 to 180 nanometer, more preferably in the range of from 95 to 160 nanometer, determined as described in Reference Example 5, said molding preferably exhibiting a total pore volume of at least 0.4 mL/g, determined as described in Reference Example 2, and a crushing strength of at least 6 N, determined as described in Reference Example 3.

19. A mixture comprising a zeolitic material which exhibits a type I nitrogen adsorption/desorption isotherm determined as described in Reference Example 1, and which has framework type MFI and a framework structure comprising Si, O, and Ti,
the mixture further comprising a colloidal dispersion of silica in water,
said binder precursor exhibiting a volume-based particle size distribution characterized by a Dv10 value of at least 35 nanometer, a Dv50 value of at least 45 nanometer, and a Dv90 value of at least 65 nanometer, determined as described in Reference Example 5,

said mixture preferably having a plasticity in the range of from 500 to 3000 N, preferably in the range of from 750 to 2000 N, more preferably in the range of from 1000 to 1500 N, determined as described in Reference Example 12, wherein the colloidal dispersion of silica in water comprises the silica preferably in an amount in the range of from 25 to 65 weight-%, more preferably in the range of from 30 to 60 weight-%, more preferably in the range of from 35 to 55 weight-%, based on the total weight of the silica and the water and wherein preferably from 95 to 100 weight-%, more preferably from 98 to 100 weight-%, more preferably from 99 to 100 weight-% of the binder precursor consist of the colloidal dispersion of silica in water, wherein in said mixture, the weight ratio of the zeolitic material, relative to the sum of the zeolitic material and the binder calculated as SiO_2, is preferably in the range of from 2 to 90 %, more preferably in the range of from 5 to 70 %, more preferably in the range of from 10 to 50 %, more preferably in the range of from 15 to 30 %, more preferably in the range of from 20 to 25 %, wherein said mixture preferably further comprises one or more additives, preferably one or more viscosity modifying agents, or one or more mesopore forming agents, or one or more viscosity modifying agents and one or more mesopore forming agents.

20. Use of the mixture according to claim 19 for preparing a chemical molding, preferably a chemical molding according to any one of claims 1 to 6 or according to claim 16.