

Claims

1. Silica-based granular material comprising silica and at least one IR-opacifier selected from the group consisting of silicon carbide, titanium dioxide, zirconium dioxide, ilmenites, iron titanates, iron oxides, zirconium silicates, manganese oxides, graphites, carbon blacks and mixtures thereof,
5 hydrophobized with a surface treatment agent comprising a silicon atom, wherein the granular material has:
a) a cumulative pore volume of pores > 4 nm of more than 2.5 cm³/g, as determined by the mercury intrusion method according to DIN ISO 15901-1;
10 b) a tamped density of 140 g/L to 290 g/L;
c) a number of silanol groups relative to BET surface area d_{SiOH} of at least 0.5 SiOH/nm², as determined by reaction with lithium aluminium hydride;
d) a number of silicon atoms in the surface treatment agent relative to BET surface area $d_{\text{[Si]}}$ of at least 1.0 [Si atoms]/nm².
- 15 2. Granular material according to claim 1, comprising 30% to 95% by weight of silica selected from fumed silica, precipitated silica, silica aerogel, silica xerogel, and mixtures thereof.
3. Granular material according to either of claims 1 to 2, comprising 1% to 70% by weight of at least one IR-opacifier selected from the group
20 consisting of silicon carbide, titanium dioxide, zirconium dioxide, ilmenites, iron titanates, iron oxides, zirconium silicates, manganese oxides, graphites, carbon blacks and mixtures thereof.
4. Granular material according to either of claims 1 to 3, wherein the surface treatment agent comprising a silicon atom is selected from the
25 group consisting of organosilanes, silazanes, acyclic polysiloxanes, cyclic polysiloxanes, and mixtures thereof.
5. Granular material according to either of Claims 1 to 4, wherein numerical median particle size d_{50} of the granular material is from 10 µm to 5000 µm.
- 30 6. Granular material according to either of Claims 1 to 5, wherein at least 5% by weight of the granular material has particle size of less than 200 µm.
7. Granular material according to either of Claims 1 to 6, wherein carbon content of the granular material is from 0.5% to 10% by weight.
- 35 8. Granular material according to either of Claims 1 to 7,

wherein a pore volume for pores smaller than 4 μm of the granular material, determined by mercury intrusion method according to DIN ISO 15901-1, is 2 cm^3/g - 5 cm^3/g .

9. Granular material according to either of Claims 1 to 8,
5 having the percent ratio of a pore volume for pores < 4 μm to a cumulative pore volume of pores > 4 μm , both pore volumes determined by mercury intrusion method according to DIN ISO 15901-1, of more than 35 %.
10. Granular material according to either of Claims 1 to 9,
10 wherein a skeletal density of the granular material, determined by mercury intrusion method according to DIN ISO 15901-1 at 417 MPa, is at least 0.6 g/mL.
11. Granular material according to either of Claims 1 to 10,
wherein the ratio $d_{[\text{sil}]} / d_{\text{SiOH}}$ of 1 to 10.
12. Process for producing silica-based granular material according to either of claims 1 to 11, comprising the following steps:
15 a) dry densifying the powder comprising hydrophilic silica and at least one IR-opacifier selected from the group consisting of silicon carbide, titanium dioxide, zirconium dioxide, ilmenites, iron titanates, iron oxides, zirconium silicates, manganese oxides, graphites, carbon blacks and mixtures thereof to give a hydrophilic granular material with a tamped density of at least 80 g/L;
20 b) subjecting the hydrophilic granular material produced in step a) to thermal treatment at a temperature of 300 $^{\circ}\text{C}$ to 1400 $^{\circ}\text{C}$;
c) hydrophobizing the hydrophilic granular material subjected to thermal treatment in step b) in the presence of a surface treatment agent comprising a silicon atom and water, wherein the molar ratio of water to the silicon atoms in the surface treatment
25 agent comprising a silicon atom is from 0.1 to 100.
13. Thermal insulating composition comprising the granular material according to either of Claims 1 to 11.
14. Thermal insulating composition according to Claim 13, further comprising a binder selected from the group consisting of (meth)acrylates, alkyd resins, epoxy resins,
30 gum Arabic, casein, vegetable oils, polyurethanes, silicone resins, hybrid systems containing silicone based and other organic ingredients, wax, cellulose glue, and mixtures thereof.
15. Use of granular material according to either of Claims 1 to 11 for thermal and/or acoustic insulation.