Patent claims

1. A method for producing a raised marking on a glass object in that a suspension containing SiO_2 particles is applied to a surface of the glass object as a pattern, and the pattern is compacted to form the marking, characterized in that a binder-free suspension is used to create a marking on a quartz glass object, said suspension containing a dispersion liquid and amorphous SiO_2 particles having particle sizes of up to a maximum of 500 µm, of which are between 0.2% by wt. and 15% by wt. SiO_2 nanoparticles having particle sizes of less than 100 nm, and the solids content thereof, i.e. the weight proportion of the SiO_2 particles and of the SiO_2 nanoparticles together, is in the range between 60% and 90%.

2. The method according to claim 1, characterized in that the suspension is applied by spraying or dispersion coating.

3. The method according to claim 1, characterized in that the suspension contains SiO_2 nanoparticles in the range of between 0.5% by wt. and 5% by wt., preferably between 1% by wt. and 3% by wt., based on the total solids content.

4. The method according to any one of the preceding claims, characterized in that the pattern is compacted at a temperature in the range between 1100°C and 1600°C, preferably below 1450°C.

5. The method according to any one of claims 1 to 3, characterized in that the pattern is compacted at a temperature above 1600°C.

6. The method according to any one of the preceding claims, characterized in that the suspension is applied via a mask which predetermines the pattern and is placed on the surface.

7. The method according to any one of the preceding claims, characterized in that a marking is produced with a layer thickness in the range between 0.1 mm and 0.5 mm.

8. The method according to any one of the preceding claims, characterized in that SiO_2 particles with particle sizes in the range between 1 µm and 60 µm account for the greatest volume fraction, the SiO_2 particles having a multimodal particle size distribution with a first maximum of the size distribution in the range of 1 µm to 5 µm and a second maximum in the range of 5 µm to 50 µm.

9. The method according to any one of the preceding claims, characterized in that the suspension has a solids content in the range between 70% by wt. and 80% by wt.

10. The method according to any one of the preceding claims, characterized in that at least 80% by wt., preferably at least 90% by wt., of the SiO_2 particles are made spherical.

11. The method according to any one of the preceding claims, characterized in that the SiO_2 particles have a particle size distribution that is distinguished by a D_{50} value of less than 50 µm, preferably of less than 40 µm.

12. The method according to any one of the preceding claims, characterized in that a mixture of water and of an organic solvent, preferably based on alcohol, is used as the dispersion liquid.

13. The method according to any one of the preceding claims, characterized in that the SiO_2 particles consist of naturally occurring raw material and the SiO_2 nanoparticles of synthetic SiO_2.

14. The method according to any one of the preceding claims, characterized in that the SiO_2 content of the amorphous SiO_2 particles is at least 99.9% by wt.

Patent Claims

1. A method for producing a raised marking on a glass object in that a suspension containing SiO_2 particles is applied to a surface of the glass object as a pattern, and the pattern is compacted to form the marking, characterized in that a binder-free suspension is used to create a marking on a quartz glass object, said suspension containing a dispersion liquid and amorphous SiO_2 particles having particle sizes of up to a maximum of 500 µm, wherein the suspension contains between 0.2% by wt. and 15% by wt. SiO_2 nanoparticles having particle sizes of less than 100 nm, and the solids content thereof, i.e. the weight proportion of the SiO_2 particles and of the SiO_2 nanoparticles together, is in the range between 60% and 90%.

2. The method according to claim 1, characterized in that the suspension is applied by spraying or dispersion coating.

3. The method according to claim 1, characterized in that the suspension contains SiO_2 nanoparticles in the range of between 0.5% by wt. and 5% by wt., based on the total solids content.

4. The method according to claim 3, characterized in that the suspension contains SiO_2 nanoparticles in the range of between 1% by wt. and 3% by wt., based on the total solids content.

5. The method according to any one of claims 1 to 4, characterized in that the pattern is compacted at a temperature in the range between 1100°C and 1600°C.

6. The method according to any one of claims 1 to 4, characterized in that the suspension is applied via a mask which predetermines the pattern and is placed on the surface.

7. The method according to any one of claims 1 to 4, characterized in that a marking is produced with a layer thickness in the range between 0.1 mm and 0.5 mm.

8. The method according to any one of claims 1 to 4, characterized in that SiO_2 particles with particle sizes in the range between 1 µm and 60 µm account for the greatest volume fraction, the SiO_2 particles having a multimodal particle size distribution with a first maximum of the size distribution in the range of 1 µm to 5 µm and a second maximum in the range of 5 µm to 50 µm.

9. The method according to any one of claims 1 to 4, characterized in that the suspension has solids content in the range between 70% by wt. and 80% by wt.

10. The method according to any one of claims 1 to 4, characterized in that at least 80% by wt. of the SiO_2 particles are made spherical.

11. The method according to any one of claims 1 to 4, characterized in that the SiO_2 particles have a particle size distribution that is distinguished by a D_{50} value of less than 40 µm.

12. The method according to any one of claims 1 to 4, characterized in that a mixture of water and of an organic solvent is used as the dispersion liquid.

13. The method according to any one of claims 1 to 4, characterized in that the SiO_2 particles consist of naturally occurring SiO_2 raw material and the SiO_2 nanoparticles of synthetic SiO_2.