CLAIMS

1. Process for antireflective treatment in the visible region of a material made of sapphire, consisting of a bombardment with a beam of a mixture of mono- and multicharged ions of a gas which are produced by an electron cyclotron resonance (ECR) source, where:

- an acceleration voltage is chosen within a range of between 10 and 100 kV;

- an implanted dose of ions, expressed in ions/cm^2, is chosen within a range of between 10^{16} and 3 x 10^{17} ions/cm^2;

- a rate of displacement V_D, expressed in cm/s, is chosen within a range of between 0.1 cm/s and 5 cm/s;

wherein the process further comprises a preliminary step comprising:

adjusting the rate of displacement V_D within a rate range of between 0.025 x (P/D) and 0.1 x (P/D), where P is the power of the beam, expressed in W (watts), and D is the diameter of the beam, expressed in cm (centimeters), the adjustment of the rate of displacement V_D being carried out while keeping the implanted dose of ions, the acceleration voltage, the beam diameter, the displacement amplitude of the beam, and the advance amplitude of the beam constant.

2. Process according to Claim 1, characterized in that the mono- and multicharged ions of a gas of the beam of a mixture of mono- and multicharged ions are selected from the ions of the elements of the list consisting of helium (He), neon (Ne), argon (Ar), krypton (Kr) and xenon (Xe).

3. Process according to Claim 1, characterized in that the mono- and multicharged ions of a gas of the beam of a mixture of mono- and multicharged ions are selected from the ions of the gases of the list consisting of nitrogen (N_2) and oxygen (O_2).

4. Process according to any one of the preceding claims, characterized in that the implanted dose, expressed in ions/cm^2, is between $(5 \times 10^{16}) \times (M/14)^{-1/2}$ and $10^{17} \times (M/14)^{-1/2}$, where M is the atomic mass of the ion.

5. The process according to any one of the preceding claims, characterized in that the beam has a displacement amplitude A, expressed in cm, wherein said displacement amplitude A is chosen so that $(P/A^2) > 0.04$ W/cm^2, where P is the power of the beam, expressed in W (watts).

6. Process according to any one of the preceding claims, characterized in that the beam of a mixture of mono- and multicharged ions of a gas comprises 10% of multicharged ions or more than 10% of multicharged ions.

7. Process according to any one of the preceding claims, characterized in that the dose of mono- and multicharged ions of a gas which are implanted per unit of surface area is chosen in order to achieve an atomic concentration of implanted ions of greater than or equal to 5%.

8. Process according to any one of the preceding claims, characterized in that the rate of displacement V_D is chosen in order to obtain, in the treated thickness, nanocavities for which the mean size does not exceed 15 nm in a depth of between 5 and 70 nm.

9. Process according to the preceding claim, characterized in that the part made of sapphire is displaced under the beam of a mixture of mono- and multicharged ions of a gas according to a plurality N of passes at the rate V_D.

10. Part made of sapphire comprising at least one surface with an implanted ion according to any one of the preceding claims, characterized in that the reflectance Y of just one treated face is less than or equal to 9% for a wavelength of 530 nm and in that the Mohs hardness is greater than or equal to 7 on the Mohs scale.

11. Part made of sapphire comprising at least one surface with an implanted ion according to any one of claims 1 to 9, characterized in that the mean size of the nanocavities created in a depth of between 5 and 70 nm does not exceed 15 nm.

12. Part made of sapphire of claim 10 or 11, comprising, starting from the surface in the direction of the depth:

- a compact layer (1) with a thickness of between 5 and 10 nm;
- a porous amorphous layer (2) with a porosity of between 10% and 60%, with a thickness of between 50 and 60 nm, with nanocavities having a mean size of less than 15 nm.

13. Use of the treatment process according to any one of Claims 1 to 9 for treating a part made of sapphire chosen from the list consisting of a touch screen, of a watch glass or of a lens of an optical device.