This results in the need for a method for the surface treatment of glass materials in order to introduce hydrophilic, indeed even superhydrophilic (antifogging), properties which are resistant to mechanical stresses, insensitive to the brightness conditions and effective at any moment which requires it, over a very long period of time, preferably according to methods which can be easily operated industrially, so as to be able to offer such glass materials in a significant amount and at reasonable costs.

Summary

The aim of the ~~invention~~ disclosure is to provide a method for the treatment of glass materials which is relatively inexpensive and which makes it possible to treat surfaces corresponding to the requirements of numerous applications.

The ~~invention~~ disclosure thus provides a process for the treatment by an ion beam of a glass material which comprises an ion bombardment where:

- the ions of the ion beam are selected from the ions of the elements from the list consisting of nitrogen (N) and oxygen (O);

- the acceleration voltage of the ions is greater than or equal to 5 kV and less than or equal to 1000 kV;

- the temperature of the metal layer is less than the glass transition temperature of the glass;

- the dose of ions per unit of surface area is chosen within a range of between 10^{12} ions/cm^2 and 10^{18} ions/cm^2, so as to modify the surface characteristics of the glass material in the direction of a greater hydrophilicity (a better wettability) which is characterized by a contact angel of a drop of water of less than 45°, indeed even in the direction of a superhydrophilicity which is

characterized by a contact angle of a drop of water of less than 20°, preferably of less than 10°.

In one aspect, there is provided a treatment process for enhancing the hydrophilic properties of a glass material, characterized in that it consists of an ion bombardment where: - the ions of the ion beam are selected from the ions of the elements of the list consisting of nitrogen (N) and oxygen (O); - the acceleration voltage, AV, of the ions is greater than or equal to 5 kV and less than or equal to 1000 kV , in particular greater than or equal to 5 kV and less than or equal to 200 kV, indeed even greater than or equal to 10 kV and less than or equal to 100 kV; - the temperature of the glass material is less than or equal to the glass transition temperature; - the dose of ions per unit of surface area is located within a range of between 10^{12} ions/cm^2 and 10^{18} ions/cm^2, in particular of greater than or equal to 10^{15} ions/cm^2, indeed even of greater than or equal to 10^{15} ions/cm^2 and less than or equal to 10^{17} ions/cm^2.

In another aspect, there is a provided a glass part comprising at least one hydrophilic surface treated as described herein.

In another aspect, there is provided the use of the hydrophilic treatment process as described herein in order to treat a bulk glass part chosen from the list consisting of a motor vehicle windshield, a spectacle lens, a lens of an optical device, a mirror, a window of a building, an optical fiber and a glass syringe body.

The choice of the ions and of the conditions of bombardment of these ions according to the invention makes it possible to advantageously obtain an increase in the hydrophilicity of the glass material which is expressed by a reduction in the contact angle and an increase in the

surface energy of the glass material treated. These properties are very important in reducing the formation of mist on a motor vehicle windshield, spectacle lenses, lenses or mirrors of optical devices, or structural glasses. Antifogging property denotes the behavior and the quality of a glass material in slowing down, reducing or preventing the formation of a condensate of moisture in the mist form.

Surprisingly, the inventors have been able to find that the ranges chosen according to the invention for acceleration voltage and dose of ions per unit of surface area make it possible to select experimental conditions where the strengthening of hydrophilic properties toward a superhydrophilicity (characterized by a contact angle of a drop of water of less than 20°, indeed even of less than 10°) associated with antifogging properties is possible by virtue of an ion bombardment.

This superhydrophilicity put at the service of antifogging properties can also prove to be highly advantageous for increasing the surface energy of an optical cladding of an optical fiber, for thus improving the adhesion of the protective cladding (made of polymer) which surrounds the optical cladding.

It is also possible to look for hydrophilic, indeed even superhydrophilic, properties in order to promote the