Claims

1) Method for making a chemically strengthened glass substrate comprising the following operations:

a) providing a substrate having first and second major opposing sides where at least a part of the first side of the substrate is provided with first implanted ions selected among the ions of O, Ar, N or He that reduce the extent of ion exchange upon chemical strengthening,

b) chemically strengthening the ion implanted glass substrate.

2) Method according to claim 9 wherein at least a part of the first side of the substrate is provided with second implanted ions that reduce the extent of ion exchange upon chemical strengthening, and where the implantation profile of the second implanted ions is different from the first implantation profile.

3) Method according to claims 9 or 10 wherein at least part of the second side of the substrate has been provided with third implanted ions that reduce extent of ion exchange upon chemical strengthening..

4) Method according to claims 9 to 11 wherein the first, second and/or third ion implantation profiles are such that a first, second and/or third controlled curvature is obtained upon chemical strengthening.

5) Method according to claim 9 wherein the substrate's first and second opposing sides have differing ion exchange properties in their non-ion implanted state, the first being a high ion exchange side and the second being a low ion exchange side.

6) Method according to claim 9 or 13 wherein the substrate is provided with first implanted ions on the entirety of the first side.

7) Method according to claim 13 wherein the first ion implantation

profile is such that a first controlled curvature comprised between -0.04 x 1/m and 0.04 x 1/m is obtained upon chemical strengthening.

8) Method according to claim 11 wherein the second and/or third implanted ions are selected among the ions of O, Ar, N or He.

9) Method according to claims 9 to 16 wherein the first, second and/or third implanted ions are single charge ions or a mixture of single charge ions and multicharge ions.

10) Method according to claims 9 to 17 wherein the implantation depth of the first, second and/or third ion implantation profiles is comprised between 0.1 µm and 1 µm, preferably between 0.1 µm and 0.5 µm.

11) Method according to claims 9 to 18 wherein the ion dosage of the first, second and/or third ion implantation profiles is comprised between 10^{12} ions/cm² and 10^{18} ions/cm², preferably between 10^{15} ions/cm² and 10^{18} ions/cm².

12) Method according to claims 9 to 19 wherein the glass substrate is chosen among a soda-lime glass substrate and an alumino-silicate glass substrate.

13) Method according to claims 9 to 20 wherein the glass substrate's thickness is comprised between 0.1 mm and 3 mm, preferably between 0.1 and 1.6 mm.

14) Chemically strengthened glass substrate having first and second major opposing sides with differing ion exchange properties in their non-ion implanted state before chemical strengthening, the first being a high ion exchange side and the second being a low ion exchange side, having a thickness comprised between 0.1 mm and 3 mm, having a curvature comprised between -0.04 x 1/m and 0.04 x 1/m and wherein a first ion implantation profile is present on at least part of the first side and wherein the ions of the first ion implantation profile are selected among the ions of O, Ar, N or He.

15) Chemically strengthened glass substrate according to claim 22 having a curvature between -0.01 x 1/m and 0.01 x 1/m.

16) Chemically strengthened glass substrate according to claims 22 or 23 having a thickness comprised between 0.1 mm and 1.6 mm, preferably between 0.1 mm and 1.3 mm.

17) Glass substrate according to claims 22 to 24 having on both sides a compressive surface stress comprised between 300 and 1300 MPa and a depth of compressive layer comprised between 6 and 40 µm.

18) Glass substrate according to claims 22 to 25 where the glass substrate is chosen among a soda-lime glass substrate and an alumino-silicate glass substrate.

19) Use of an ion implantation profile in a glass substrate for reducing the extent of ion exchange upon chemical strengthening of the glass substrate wherein the ions of the ion implantation profile are selected among the ions of O, Ar, N or He.

20) Use of an ion implantation profile that reduces the extent of ion exchange upon chemical strengthening in a glass substrate to control the glass substrate curvature upon chemical strengthening wherein the ions of the ion implantation profile are selected among the ions of O, Ar, N or He.

21) Use of an ion implantation profile in a glass substrate according to claims 27 to 28 wherein the ions of the ion implantation profile are single charge ions or a mixture of single charge ions and multicharge ions.

22) Use of an ion implantation profile in a glass substrate according to claims 27 to 29 wherein the implantation depth of the ion implantation profile is comprised between 0.1 µm and 1 µm, preferably between 0.1 µm and 0.5 µm.

23) Use of an ion implantation profile in a glass substrate according to

claim 27 to 30 wherein the ion dosage of the ion implantation profile is comprised between 10^{12} ions/cm² and 10^{18} ions/cm², preferably between 10^{15} ions/cm² and 10^{18} ions/cm².

24) Use of an ion implantation profile in a glass substrate according to claims 27 to 31 wherein the glass substrate's thickness is comprised between 0.1 mm and 3 mm, preferably between 0.1 mm and 1.3 mm.

25) Use of an ion implantation profile in a glass substrate according to claims 27 to 32 wherein the glass substrate is a soda-lime glass substrate or an alumino-silicate glass substrate.