OBJECTIVE OF THE INVENTION

Embodiments of the invention seek to provide a process that can obviate the drawbacks of the prior art. Embodiments of the invention provide a process for smoothing the surface of a silicone-on-insulator structure that can make it possible to limit the appearance of peripheral zones of residual roughness, without degrading the thickness uniformity of the surface layer and of the buried dielectric.

BRIEF DESCRIPTION OF THE INVENTION

Embodiments of the invention provide a process for smoothing a silicon-on-insulator structure comprising the exposure of a surface of the structure to an inert or reducing gas flow and to a high temperature during a heat treatment, the process comprising a first heat treatment step at a first temperature and under a first gas flow defined by a first flow rate. The process is noteworthy in that it also comprises a second heat treatment step at a second temperature lower than the first temperature and under a second gas flow defined by a second flow rate lower than the first flow rate.

The first step of the process enables the effective surface smoothing concurrently with a uniform dissolution phenomenon. During the second step of the process, a smoothing of the surface may also be carried out and may rectify the peripheral zones of residual roughness generated during the first step. The temperature conditions of the second heat treatment are such that the dissolution phenomenon is very slow or even non-existent, which makes it possible to reduce the gas flow and thus to limit the contaminants injected into the furnace that are capable of hampering the smoothing (in particular by creating said peripheral zones of residual

CLAIMS

1. A method for smoothing a silicon-on-insulator structure comprising the exposure of a surface of the structure to an inert or reducing gas flow and to a high temperature during a heat treatment, the method comprising:

   a first heat treatment step at a first temperature greater than a threshold temperature which is between 1150° C. and 1170° C., and under a first gas flow defined by a first flow rate greater than 20 slm; and

   a second heat treatment step at a second temperature lower than the first temperature and the threshold temperature and greater than 1130° C., and under a second gas flow defined by a second flow rate lower than the first flow rate and less than 15 slm.

2. The method of claim 1, further comprising a preliminary step of supplying the SOI structure comprising a thin surface layer positioned on a dielectric layer, the dielectric layer positioned on a carrier substrate, the surface layer having a thickness of less than 500 nm.

3. The method of claim 1, wherein the first temperature is between 1160° C. and 1200° C.

4. The method of claim 3, wherein the first temperature is between 1170° C. and 1200° C.

5. The method of claim 1, wherein the second temperature is between 1130° C. and 1160° C.

6. The method of claim 1, wherein the second heat treatment step comprises a hold at the second temperature of a given duration.

7. The method of claim 6, wherein the duration of the hold is between 5 minutes and 2 hours.

8. The method of claim 1, wherein the second heat treatment step comprises a temperature decrease ramp, starting from the second temperature, at a decrease ramp rate of between 0.1°/minute and 20°/minute.

9. The method of claim 1, wherein the second flow rate is about 5 slm.

10. The method of claim 9, wherein the inert gas is selected from argon or a mixture of argon and hydrogen.

11. The method of claim 1, wherein the first heat treatment step and second heat treatment step are linked together during the same heat treatment.

12. The method of claim 1, wherein the first temperature is greater than a threshold temperature and the second temperature is lower than the threshold temperature, the threshold temperature being between 1150° C. and 1170° C.

13. The method of claim 1, wherein the second temperature is between 1130° C. and 1170° C.

14. The method of claim 1, wherein the second heat treatment step comprises a hold at the second temperature of a given duration.

15. The method of claim 1, wherein the first flow rate is greater than 20 slm, and wherein the second flow rate is less than 15 slm.

16. The method of claim 1, wherein the inert gas is selected from argon or a mixture of argon and hydrogen.

17. The method of claim 1, wherein the first heat treatment step and second heat treatment step are linked together during the same heat treatment.

18. The method of claim 1, wherein the surface of the structure is smoothened and dissolution of an insulator layer occurs during the first heat treatment.