

the monocrystalline silicon layer 12 is transferred to the receiving substrate 2 by detaching the donor substrate along the weakened zone 14 (cf. Figure 1E);

- trenches T are formed around a portion of the stack consisting of the strained silicon-germanium layer 20, the buried oxide layer 13 and the transferred semiconductor layer 12, said trenches extending into the receiver substrate 2 beyond the strained silicon-germanium layer 20 (cf. Figure 1F). Said cutting operation results in the at least partial relaxation of the silicon-germanium and the transmission of at least part of said strain to the transferred silicon layer in said portion, thus allowing the strained semiconductor-on-insulator substrate, denoted by sSOI, to be formed.

For FDSOI technologies, it is necessary for the surface of the strained silicon layer to exhibit a high degree of roughness and for the thickness of said layer to be highly uniform. Thus, typically, the roughness of the surface as characterized by atomic force microscopy should have an RMS value of less than 1 Å over a field of measurement of 30 x 30 µm². The uniformity of the intra-wafer thickness (i.e. the thickness within one and the same substrate) as characterized by ellipsometry should correspond to a thickness kept within 5 Å of the target mean thickness at any point on the surface of the substrate.

To achieve this, a step of finishing the transferred monocrystalline silicon layer with a view to decreasing its roughness and to thinning it in order to obtain the desired thickness should be implemented after the transfer of said layer to the receiving substrate and before the formation of the trenches.

Conventional thermal smoothing techniques cannot be used on an sSOI substrate containing a silicon-germanium layer. Specifically, the heat treatment used would cause a portion of the germanium to diffuse out of the silicon-germanium layer, resulting in a loss of effectiveness in transferring strain from said layer to the transferred monocrystalline silicon layer.

Furthermore, chemical-mechanical polishing is not compatible given the current state of the art on the subject with the desired uniformity of thickness.

BRIEF DESCRIPTION OF THE INVENTION

Embodiments of the invention seek to provide a method for fabricating a strained semiconductor-on-insulator substrate that allows the uniformity and roughness required for the strained semiconductor layer to be obtained without a loss of effectiveness in transferring strain.

According to an aspect of the invention, a method for fabricating a strained semiconductor-on-insulator substrate comprises:

(a) the provision of a donor substrate comprising a monocrystalline semiconductor layer;