

(b) the provision of a receiving substrate comprising a surface layer of a strained monocrystalline semiconductor material;

(c) the bonding of the donor substrate to the receiving substrate, a dielectric layer being at the interface between the surface layer of the receiving substrate and the monocrystalline silicon layer of the donor substrate;

(d) the transfer of the monocrystalline semiconductor layer from the donor substrate to the receiving substrate;

(e) the cutting, by means of trench isolations extending into the receiving substrate beyond the strained semiconductor material layer, of a portion from a stack formed from the transferred monocrystalline semiconductor layer, from the dielectric layer and from the strained semiconductor material layer, said cutting operation resulting in the relaxation of the strain in the strained semiconductor material, and in the application of at least a part of said strain to the transferred monocrystalline semiconductor layer;

said method being characterized in that:

- the donor substrate provided in step (a) comprises, in succession, a monocrystalline carrier substrate, an intermediate layer and said monocrystalline semiconductor layer, the intermediate layer forming an etch-stop layer with respect to the carrier substrate material and to the material of the monocrystalline semiconductor layer, step (d) comprising the transfer, to the receiving substrate, of the monocrystalline semiconductor layer, of the intermediate layer and of a portion of the carrier substrate; and

- between steps (d) and (e), a first operation of selectively etching said portion of the carrier substrate with respect to said intermediate layer and a second operation of selectively etching said intermediate layer with respect to the monocrystalline semiconductor layer are implemented.

The present text is concerned with the strain in a plane parallel to the main surface of the layers in question.

The use of a donor substrate comprising multiple layers of different chemical compositions that may be selectively etched in succession makes it possible to avoid having to use annealing for the purpose of smoothing in order to obtain the uniformity and roughness desired for the strained semiconductor layer of the final substrate.

According to advantageous features of the invention, taken alone or in combination as appropriate:

- the donor substrate is formed by epitaxy, on the monocrystalline carrier substrate, of the intermediate layer then of the monocrystalline semiconductor layer;

- the carrier substrate comprises a first material that is identical to that of the monocrystalline semiconductor layer and the intermediate layer comprises a second material that differs from the first material, the thickness of said intermediate layer being chosen so that the second material retains the lattice parameter of the first material;

CLAIMS

1. Method for fabricating a strained semiconductor-on-insulator substrate, comprising:

5 (a) the provision of a donor substrate (1) comprising a monocrystalline semiconductor layer (12);

(b) the provision of a receiving substrate (2) comprising a surface layer (20) of a strained monocrystalline semiconductor material;

10 (c) the bonding of the donor substrate (1) to the receiving substrate (2), a dielectric layer (13, 22) being at the interface between the surface layer (20) of the receiving substrate and the monocrystalline silicon layer (12) of the donor substrate;

(d) the transfer of the monocrystalline semiconductor layer (12) from the donor substrate to the receiving substrate;

15 (e) the cutting, by means of trench isolations (T) extending into the receiving substrate (2) beyond the strained semiconductor material layer (20), of a portion from a stack formed from the transferred monocrystalline semiconductor layer, from the dielectric layer and from the strained semiconductor material layer, said cutting operation resulting in the relaxation of the strain in the strained semiconductor material, and in the application of at least a part of said strain to the transferred monocrystalline semiconductor layer;

20 said method being characterized in that:

- the donor substrate (1) provided in step (a) comprises, in succession, a monocrystalline carrier substrate (10), an intermediate layer (11) and said monocrystalline semiconductor layer (12), the intermediate layer (11) forming an etch-stop layer with respect to the carrier substrate material (10) and to the material of the monocrystalline semiconductor layer (12), step (d) comprising the transfer, to the receiving substrate (2), of the monocrystalline semiconductor layer (12), of the intermediate layer (11) and of a portion (15) of the carrier substrate (10); and

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- between steps (d) and (e), a first operation of selectively etching said portion (15) of the carrier substrate with respect to said intermediate layer (11) and a second operation of selectively etching said intermediate layer (11) with respect to the monocrystalline semiconductor layer (12) are implemented.

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2. Method according to Claim 1, in which the donor substrate (1) is formed by epitaxy, on the monocrystalline carrier substrate (10), of the intermediate layer (11) then of the monocrystalline semiconductor layer (12).

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3. Method according to Claim 2, in which the carrier substrate (10) comprises a first material that is identical to that of the monocrystalline semiconductor layer (12) and the intermediate layer (11) comprises a second material that differs from the first material,