Claims

1. A process for producing a piezoelectric layer (10) on a substrate (11), wherein the process comprises the following steps:

- forming, by a first epitaxy, a seed layer (102) of a first piezoelectric material on a donor substrate (100),

- transferring the seed layer (102) and a portion (103) of the donor substrate (100) to a receiver substrate (110) via at least one electrically insulating layer and/or at least one electrically conductive layer (105) adapted to allow relaxation of the seed layer,

- removing the transferred portion (103) of the donor substrate (100) so as to expose a surface of the seed layer (102), and

- forming a monocrystalline layer (104) of a second piezoelectric material on the seed layer (102).

2. The process according to claim 1, wherein the transfer of the seed layer (102) and the portion (103) of the donor substrate (100) comprises the following steps:

- forming an embrittlement area (101) in the donor substrate (100) to delimit the portion (103) to be transferred,

- bonding the donor substrate (100) to the receiver substrate (110), with the seed layer (102) at the bonding interface,

- detachment of the donor substrate (100) along the embrittlement area (101),

and wherein the formation of the seed layer (102) on the donor substrate (100) takes place after the formation of the embrittlement area (101).

3. The process according to claim 1, wherein the transfer of the seed layer (102) and the portion (103) of the donor substrate (100) comprises the following steps:

- forming an embrittlement area (101) in the donor substrate (100) to delimit the portion to be transferred (103),

- bonding the donor substrate (100) to the receiver substrate (110), with the seed layer (102) at the bonding interface,

- detachment of the donor substrate (100) along the embrittlement area (101),

and wherein the formation of the seed layer (102) on the donor substrate (100) takes place prior to the formation of the embrittlement area (101).

4. The process according to one of claims 2 or 3, wherein the embrittlement area (101) is formed by ion implantation of hydrogen and/or helium into the donor substrate (100).

5. The process according to one of claims 1 to 4, wherein the formation of the seed layer (102) on the donor substrate (100) is carried out by atomic layer deposition.

6. The process according to one of claims 1 to 4, wherein the formation of the seed layer (102) on the donor substrate (100) is carried out by molecular beam epitaxy.

7. The process according to one of claims 1 to 6, wherein the formation of the monocrystalline layer (104) on the seed layer (102) is carried out by a second epitaxy.

8. The process according to claim 7, wherein the second epitaxy of the second piezoelectric material on the seed layer (102) is an organometallic chemical vapor deposition.

9. The process according to one of claims 1 to 6, wherein the formation of the monocrystalline layer (104) on the seed layer (102) is achieved by deposition of the second piezoelectric material in amorphous form, followed by recrystallization of said second material.

10. The process according to any of the preceding claims, wherein the seed layer (102) is between 2 nm and 20 nm.

11. The process according to one of the preceding claims, wherein the portion (103) of the donor substrate (100) transferred to the receiver substrate (110) has a thickness of less than 2 µm, preferably less than 1 µm.

12. The process according to one of the preceding claims, wherein the thickness of the layer (104) of second piezoelectric material at the end of the second epitaxy is between 20 nm and 15 µm.

13. The process according to one of claims 1 to 12, wherein the receiver substrate (110) comprises at least one electronic device or interconnect.

14. The process according to one of the preceding claims, wherein the receiver substrate (110) comprises a trap-rich layer (107).

15. The process according to one of claims 1 to 12, comprising, after formation of the monocrystalline layer of the second piezoelectric material, transferring at least part of the layer (104) of the second piezoelectric material onto a final substrate (120).

16. The process according to claim 15, wherein the portion of the layer (104) of the second piezoelectric material transferred onto the final substrate (120) has a thickness of less than 2 µm, preferably less than 1 µm.

17. The process according to one of claims 15 to 16, wherein the final substrate (120) comprises at least one electronic device or interconnect.

18. The process according to one of the claims 15 to 17, wherein the final substrate (120) comprises a trap-rich layer (121).

19. The process according to one of claims 1 to 18, wherein the first piezoelectric material and the second piezoelectric material are identical.

20. The process according to one of claims 1 to 18, wherein the first piezoelectric material and the second piezoelectric material are different.

21. The process according to one of the preceding claims, comprising, prior to the formation of the seed layer (102), the formation of an intermediate layer (106) on the donor substrate (100), said intermediate layer being adapted for the epitaxial growth of the seed layer (102) on the donor substrate (100).

22. A process for manufacturing a surface acoustic wave device, comprising forming two interdigitated electrodes (12, 13) on the surface of a piezoelectric layer (10), wherein the process for manufacturing the surface acoustic wave device further comprises manufacturing the piezoelectric layer (10) by the process according to one of claims 1 to 21.

23. A process for manufacturing a photonic device, comprising forming at least one photonic component, such as a laser, modulator, waveguide or multiplexer, at least partly in a piezoelectric layer, wherein the process for manufacturing the photonic device further comprises manufacturing the piezoelectric layer (10) by the process according to one of claims 1 to 21.

24. A surface acoustic wave device comprising a piezoelectric layer (10) obtainable by the process according to one of claims 1 to 21, and two interdigitated electrodes (12, 13) on one side of the piezoelectric layer (10).

25. A photonic device comprising a piezoelectric layer obtainable by the process according to one of claims 1 to 21, and at least one photonic component, such as a laser, modulator, waveguide or multiplexer, formed at least partially in said piezoelectric layer.

26. A structure comprising the surface acoustic wave device according to claim 24 and the photonic device according to claim 25, wherein said surface acoustic wave device and said photonic device are arranged at least partly in the same piezoelectric layer.