ferroelectric material partially addressing at least the aforementioned drawbacks. More particularly, embodiments of the disclosure seek to provide a method for transferring a layer of ferroelectric material implementing a step of implanting light species, the method preserving or being able to restore the monodomain quality of the transferred layer over its entire thickness. It can therefore be unnecessary, in the layer preparation method, to subject the latter to an electric field to restore its monodomain quality, and it can be transferred onto an electrically insulating substrate or provided with a dielectric layer.

BRIEF DESCRIPTION OF THE INVENTION

An aspect of the disclosure provides a method for preparing a thin monodomain layer of ferroelectric material comprising the following steps:

- implanting light species in a first face of a ferroelectric donor substrate to form an embrittlement plane and define a first layer between the embrittlement plane and the first face of the donor substrate;
- assembling the first face of the donor substrate to a support substrate by means of a dielectric assembly layer;
- fracturing the donor substrate at the embrittlement plane in order to transfer the first layer onto the support substrate and expose a free face of the first layer; and
- finishing the first layer, this finishing comprising heat treatment of the free face of the first layer, followed by thinning of the first layer to form the thin monodomain layer;

wherein the dielectric assembly layer comprises an oxide preventing the diffusion of hydrogen towards the first layer, or the dielectric assembly layer comprises a barrier preventing the diffusion of hydrogen towards the first layer.

In an embodiment, the dielectric assembly layer comprises an oxide having a hydrogen concentration lower than that of the first layer.

- the dielectric assembly layer comprises a silicon oxide having nitrogen in a nitrogen/oxygen ratio of between 0.01 and 0.25 or between 0.05 and 0.01;

- the dielectric assembly layer is formed by a stack comprising a first oxide layer disposed on the side of the support substrate and a layer of silicon nitride disposed on the side of the first layer;

Another aspect of the disclosure provides a device comprising:

- a thin fully monodomain layer of a ferroelectric material layer;
- a dielectric assembly layer in contact with the thin layer and comprising an oxide preventing the diffusion of hydrogen toward the thin layer, or comprising a barrier preventing the diffusion of hydrogen toward the first layer; and
- a support substrate in contact with the dielectric layer;

wherein the dielectric assembly layer comprises an oxide having nitrogen in a nitrogen/oxygen ratio greater than or equal to 0.01.

According to other advantageous and non-limiting characteristics of this aspect of the invention, taken alone or in any technically feasible combination:

- the support substrate is provided with a charge trapping layer placed between a solid part of the support and the dielectric assembly layer;

- the dielectric assembly layer comprises an oxide having nitrogen in a nitrogen/oxygen ratio greater than or equal 0.05;

- the dielectric assembly layer comprises a silicon oxide having nitrogen in a nitrogen/oxygen ratio of between 0.01 and 0.25 or between 0.05 and 0.01;

- the dielectric assembly layer is formed by a stack comprising a first oxide layer disposed on the side of the support substrate and a layer of silicon nitride disposed on the side of the first layer.

BRIEF DESCRIPTION OF THE FIGURES

Other features and advantages of the invention will become apparent from the detailed

CLAIMS

1. A method for preparing a thin monodomain layer of ferroelectric material, the method comprising the following steps:
   - implanting light species in a first face of a ferroelectric donor substrate to form an embrittlement plane and define a first layer between the embrittlement plane and the first face of the donor substrate;
   - assembling the first face of the donor substrate to a support substrate by means of a dielectric assembly layer;
   - fracturing the donor substrate at the embrittlement plane in order to transfer the first layer onto the support substrate and expose a free face of the first layer; and
   - finishing the first layer, the finishing comprising a heat treatment of the free face of the first layer, followed by thinning of the first layer to form the thin monodomain layer;
   wherein the dielectric assembly layer comprises an oxide preventing a diffusion of hydrogen towards the first layer, or the dielectric assembly layer comprises a barrier preventing the diffusion of hydrogen towards the first layer.

2. The method according to the preceding claim, wherein the thinning comprises chemical-mechanical polishing applied to the free face of the first layer.

3. The method according to one of the preceding claims, wherein the heat treatment is carried out at a temperature between 300°C and the Curie temperature of the ferroelectric material making up the first layer, and for a period of between 30 minutes and 10 hours.

4. The method according to one of the preceding claims, wherein the heat treatment is carried out under an oxidizing or neutral gaseous atmosphere.

5. The method according to one of the preceding claims, wherein the donor substrate comprises a ferroelectric material chosen from $LiTaO_3$ or $LiNbO_3$.

6. The method according to one of the preceding claims, wherein the ferroelectric material has a crystal direction of between 30° and 60° RY.

7. The method according to one of the preceding claims, wherein the material of the support substrate is silicon.

8. The method according to one of the preceding claims, wherein the donor substrate is a block of solid material.

9. The method according to one of the preceding claims, wherein the donor substrate comprises a thick layer of ferroelectric material placed on a manipulator substrate.

10. The method according to claim 9, wherein the manipulator substrate has a thermal expansion coefficient identical or close to the thermal expansion coefficient of the support substrate.

11. The method according to one of the preceding claims, wherein the material of the first layer and the material of the support substrate have different thermal expansion coefficients.

12. The method according to one of the preceding claims, wherein the dielectric assembly layer comprises an oxide having nitrogen in a nitrogen/oxygen ratio greater than or equal to 0.01.

13. The method according to one of the preceding claims, wherein the dielectric assembly layer comprises a silicon oxide having nitrogen in a nitrogen/oxygen ratio of between 0.01 and 0.25.

14. The method according to one of the preceding claims, wherein the dielectric assembly layer is formed by a stack comprising a first oxide layer disposed on the side of the support substrate and a layer of silicon nitride disposed on the side of the first layer.

15. A device comprising:
- a thin fully monodomain layer of a ferroelectric material layer;
- a dielectric assembly layer in contact with the thin layer and comprising an oxide preventing a diffusion of hydrogen towards the thin layer, or comprising a barrier preventing a diffusion of hydrogen towards the first layer; and
- a support substrate in contact with the dielectric layer;

wherein the dielectric assembly layer comprises an oxide having nitrogen in a nitrogen/oxygen ratio greater than or equal to 0.01.

16. The device according to claim 15, wherein the support substrate is provided with a charge trapping layer positioned between a solid part of the support substrate and the dielectric assembly layer.

17. The device according to claim 15 or 16, wherein the dielectric assembly layer comprises a silicon oxide having nitrogen in a nitrogen/oxygen ratio of between 0.01 and 0.25.

18. The device according to one of claims 15 to 17, wherein the dielectric assembly layer is formed by a stack comprising a first oxide layer placed on the side of the support substrate and a layer of silicon nitride placed on the side of the first layer.