CLAIMS

1. A method for preparing a thin film of monocrystalline ferroelectric material, the method comprising the following steps:
   - a step of providing the thin film, the thin film exposing a first free face;
   - a step of thinning the thin film by ion etching and defined by etching parameters;
   the method being characterized in that the step of providing comprises the assembly of a donor substrate comprising an embrittlement plane with a support substrate and the detachment of the thin film at the level of the embrittlement plane, the thin film having a second face opposite the free face and placed on the support substrate, and in that the etching parameters are chosen so that the free face of the thin film has a roughness which does not exceed a threshold value at the end of the thinning step.

2. The method according to the preceding claim, wherein the step of providing comprises the formation of the embrittlement plane by implantation of hydrogen ions in the donor substrate.

3. The method according to one of the preceding claims, wherein the thinning step is followed by chemical-mechanical touch-polishing of the free face.

4. The method according to one of the preceding claims, wherein the step of providing comprises a thermal treatment step exposing the free face of the thin film to a certain gaseous atmosphere.

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

6. The method according to claim 4 or 5, wherein the thermal treatment step is carried out under an oxidizing or neutral gaseous atmosphere.

7. The method according to one of claims 4 to 6 comprising, between the thermal treatment step and the thinning step, a step of smoothing the free face to reduce its surface roughness to a value lower than the roughness threshold value.

8. The method according to the preceding claim, wherein the smoothing step comprises chemical-mechanical touch-polishing of the free face.

9. The method according to one of the preceding claims, wherein the roughness threshold value is between 3 nm and 7 nm.

10. A substrate comprising a thin film of monocrystalline and monodomain ferroelectric material arranged on a support, the thin film having a thickness less than or equal to 700 nm and a thickness uniformity less than or equal to 60 nm.

11. The substrate according to claim 10, comprising an amorphous interlayer placed between the thin film and the support.

12. The substrate according to claim 11, wherein the amorphous interlayer is a silicon oxide, a silicon oxynitride or a silicon nitride.

13. The substrate according to one of claims 10 to 12, wherein the thin film comprises a free face having a roughness of less than 0.5 nm.

14. The substrate according to one of claims 10 to 13, wherein the ferroelectric material of the thin film is $LiTaO_3$ or $LiNbO_3$.

15. The substrate according to one of claims 10 to 14, wherein the support comprises, on the side of the thin film, a charge trapping layer.