CLAIMS

1. A composite structure, comprising:
   - a receiver substrate comprising at least one cavity defined in said substrate and devoid of solid material or filled with a sacrificial solid material,
   - a single-crystal semiconductor layer placed on the receiver substrate, said layer having a free surface over the entire extent of the structure and a thickness comprised between 0.1 micron and 100 microns,
   - a piezoelectric layer that is securely fastened to the single-crystal semiconductor layer and placed between the latter and the receiver substrate,
   at least one segment of the single-crystal semiconductor layer being intended to form a movable membrane above the cavity, when the latter is devoid of solid material or after the sacrificial solid material has been removed,
   and the piezoelectric layer being intended to cause or to detect the deformation of said membrane.

2. The composite structure according to the preceding claim, wherein the piezoelectric layer comprises a material chosen from lithium niobate (LiNbO3), lithium tantalate (LiTaO3), potassium-sodium niobate ($K_xNa_{1-x}NbO_3$ or KNN), barium titanate (BaTiO3), quartz, lead zirconate titanate (PZT), a compound of lead-magnesium niobate and of lead titanate (PMN-PT), zinc oxide (ZnO), aluminium nitride (AlN), and aluminium-scandium nitride (AlScN).

3. The composite structure according to one of the preceding claims, wherein the piezoelectric layer has a thickness smaller than 10 microns, and preferably smaller than 5 microns.

4. The composite structure according to one of the preceding claims, wherein the single-crystal semiconductor layer is made of silicon or of silicon carbide.

5. The composite structure according to one of the preceding claims, wherein the piezoelectric layer is placed solely facing the - at least one - cavity of the receiver substrate.

6. The composite structure according to one of Claims 1 to 4, wherein the piezoelectric layer is placed facing the - at least one - cavity of the receiver substrate and is securely fastened to the receiver substrate beyond the - at least one - cavity.

7. A device based on a movable membrane above a cavity, said device being formed from the composite structure according to one of the preceding claims, and comprising at least two electrodes making contact with the piezoelectric layer, wherein:
- the cavity is devoid of solid material,
- and at least one segment of the single-crystal semiconductor layer forms the movable membrane above the cavity.

8. A process for fabricating a composite structure according to one of Claims 1 to 6, comprising the following steps:
a) providing a donor substrate comprising a single-crystal semiconductor layer that is bounded between a front side of the donor substrate and a buried weak plane in said donor substrate, said layer having a thickness comprised between 0.1 micron and 100 microns,
b) providing a receiver substrate comprising at least one cavity defined in said substrate and opening onto a front

side of the receiver substrate, the cavity being devoid of solid material or filled with a sacrificial solid material,

c) forming a piezoelectric layer so that it is placed on the front side of the donor substrate and/or on the front side of the receiver substrate,

d) joining the donor substrate and the receiver substrate via their respective front sides,

e) cleaving, along the buried weak plane, the single-crystal semiconductor layer from the rest of the donor substrate, in order to form the composite structure comprising the single-crystal semiconductor layer, the piezoelectric layer and the receiver substrate.

9. The fabrication process according to claim 8, wherein the buried weak plane is formed by implanting light species into the donor substrate, and the cleave along the buried weak plane is obtained via a heat treatment and/or via the application of a mechanical stress.

10. The fabrication process according to Claim 8, wherein the buried weak plane is formed by an interface having a bonding energy lower than 0.7 J/m^2.

11. The fabrication process according to one of claims 8 to 10, comprising a step of forming metal electrodes before and/or after step c), so that said electrodes make contact with the piezoelectric layer.

12. The fabrication process according to one of claims 8 to 11, wherein step c) comprises, when the piezoelectric layer is formed on the front side of the donor substrate, a local etch of said piezoelectric layer, so as to preserve the piezoelectric layer solely facing the - at least one - cavity at the end of the joining step, step d).