AIM OF THE INVENTION

Embodiments of the present invention seek to remedy some or all of the disadvantages of the prior art. Embodiments of the invention provide a hybrid structure that can enable the reduction and/or elimination of said interfering acoustic waves and can ensure a stable performance for devices operating at high frequencies.

BRIEF DESCRIPTION OF THE INVENTION

An aspect of the present invention provides a hybrid structure for surface acoustic wave device comprising a useful layer of piezoelectric material having a first face free and a second face placed on a support substrate whose coefficient of thermal expansion is lower than that of the useful layer. The hybrid structure comprises:

- a trapping layer interposed between the useful layer and the support substrate;
- at least one functional interface of determined roughness between the useful layer and the trapping layer.

The trapping layer of the hybrid structure according to the invention effectively traps the potentially generated free charge carriers in the support substrate while operating the SAW RF device elaborated on said hybrid structure. The RF performances (linearity, insertion losses) thus reach a good level, comparable or even superior to that of technologies on massive piezoelectric substrates.

The determined roughness functional interface allows efficient diffusion of the acoustic waves capable of

- the first interlayer comprises a material selected among silicon oxide, silicon nitride, silicon oxynitride, or a material of the same type as the one forming the useful layer;
- the hybrid structure comprises a second functional interface;
- the second functional interface is formed by the interface between the useful layer and a second interlayer arranged on the first interlayer, the second functional interface having a second determined roughness with a peak-to-valley amplitude greater than 0.1 micron;
- the second interlayer comprises a material selected among silicon oxide, silicon nitride, silicon oxynitride, or a material of the same type as the one forming the useful layer;
- the first interlayer and the second interlayer are formed of the same material;
- the useful layer comprises a piezoelectric material selected among lithium tantalate ($LiTaO_3$), lithium niobate ($LiNbO_3$), quartz, zinc oxide (ZnO),or aluminum nitride (AlN);
- the support substrate is a solid substrate or a composite substrate comprising at least one blank layer or comprising all or part of microelectronic components.

Another aspect of the present invention provides a surface acoustic wave device comprising a hybrid structure such as above.

Another aspect of the present invention provides a manufacturing method of a hybrid structure for a surface acoustic wave device comprising:

- a step of providing a useful layer of piezoelectric material comprising a first face and a second face having a determined roughness;
- a step of providing a support substrate having a coefficient of thermal expansion lower than the useful layer;
- an assembly step for arranging the useful layer on the support substrate;

the method being characterized in that it comprises, prior to the assembly step, a forming step of a trapping layer on the second face of the useful layer, the interface between the trapping layer and the useful layer forming a functional interface of determined roughness having a peak-to-valley amplitude greater than 0.3 micron; the assembling step being carried out between the trapping layer and the support substrate.

Another aspect of the present invention provides a manufacturing method of a hybrid structure for a surface acoustic wave device comprising:

- a step of providing a useful layer of piezoelectric material comprising a first face and a second face;
- a step of providing a support substrate having a coefficient of thermal expansion lower than the useful layer;
- an assembly step for arranging the useful layer on the support substrate;

the method being characterized in that it comprises, prior to the assembly step:

- a forming step of a trapping layer having a determined roughness on the support substrate;
- a forming step of a first interlayer on the trapping layer, the interface between the trapping layer and the