CLAIMS

[Claim 1] A preparation method for an electro-optic modulator, characterized in that it comprises:

providing a substrate; and forming a waveguide and two bottom electrodes on an upper surface of the substrate, the bottom electrodes being located on two opposite sides of the waveguide and having a spacing from the waveguide;

providing a covering dielectric layer and two metal electrodes, the covering dielectric layer being located on the upper surface of the substrate and covering the waveguide and the bottom electrodes; the metal electrodes being located in the covering dielectric layer, and further located on and connected to respective bottom electrodes;

forming a supporting substrate on an upper surface of the covering dielectric layer;

removing the substrate; and

providing a lithium niobate thin film and bonding the lithium niobate thin film to a surface of the covering dielectric layer distant from the supporting substrate; the lithium niobate thin film being located directly below the waveguide.

[Claim 2] The preparation method for an electro-optic modulator according to claim 1, characterized in that the step of providing a substrate; and forming a waveguide and two bottom electrodes on an upper surface of the substrate comprises:

providing an SOI substrate, the SOI substrate comprising a backing substrate, an buried oxide layer, and a top silicon layer stacked in a bottom-to-top order;

etching the top silicon layer of the SOI substrate to obtain the waveguide and two initial bottom electrodes; the remaining buried oxide layer and the backing substrate together serving as the substrate; and

doping the initial bottom electrodes to obtain the bottom electrodes; the bottom electrodes being heavily doped silicon electrodes.

[Claim 3] The preparation method for an electro-optic modulator according to claim 2, characterized in that the step of providing a lithium niobate thin film and bonding the lithium niobate thin film to a surface of the covering dielectric layer distant from the supporting substrate comprises:

providing a bonding substrate, the bonding substrate having a first dielectric

layer formed on it;

forming a lithium niobate thin film on an upper surface of the first dielectric layer; and

bonding the lithium niobate thin film to the surface of the covering dielectric layer distant from the supporting substrate via a bonding layer.

[Claim 4] The preparation method for an electro-optic modulator according to claim 3, characterized in that the bonding layer comprises a BCB layer.

[Claim 5] The preparation method for an electro-optic modulator according to any one of claims 1 through 4, characterized in that it further comprises the following before the step of providing a lithium niobate thin film and bonding the lithium niobate thin film to a surface of the covering dielectric layer distant from the supporting substrate:

forming a second dielectric layer and a conductive lead-out structure, the second dielectric layer being located on the surface of the covering dielectric layer distant from the supporting substrate, and the conductive lead-out structure being connected to the metal electrodes to electrically lead the metal electrodes out; the second dielectric layer having in it a first opening, the first opening exposing the waveguide, a portion of each bottom electrode, and a portion of the covering dielectric layer;

the lithium niobate thin film being bonded to a surface of the covering dielectric layer exposed by the first opening distant from the supporting substrate.

[Claim 6] The preparation method for an electro-optic modulator according to claim 5, characterized in that the step of forming a second dielectric layer and a conductive lead-out structure comprises:

forming a second dielectric layer on the surface of the covering dielectric layer distant from the supporting substrate, forming an interconnect hole in the second dielectric layer and the covering dielectric layer, the interconnect hole exposing the metal electrodes;

forming two first interconnect plugs in the interconnect hole, each first interconnect plug having one end connected to a respective metal electrode; and

forming two backside electrodes on a surface of the second dielectric layer distant from the covering dielectric layer, each backside electrode being

connected to a respective first interconnect plug; the backside electrodes and the first interconnect plugs together constituting the conductive lead-out structure.

[Claim 7] The preparation method for an electro-optic modulator according to claim 5, characterized in that the step of forming a second dielectric layer and a conductive lead-out structure comprises:

forming a second dielectric layer on the surface of the covering dielectric layer distant from the supporting substrate, forming two first interconnect plugs in the second dielectric layer and the covering dielectric layer, and forming two backside electrodes in the second dielectric layer; each first interconnect plug having one end connected to a respective metal electrode and another end connected to a respective backside electrode; the backside electrodes and the first interconnect plugs together constituting the conductive lead-out structure; and

forming the first opening and a second opening in the second dielectric layer, the second opening exposing the backside electrodes.

[Claim 8] The preparation method for an electro-optic modulator according to claim 7, characterized in that each backside electrode comprises a number of backside electrode metal layers and a number of second interconnect plugs, the backside electrode metal layers that are adjacent are connected by the second interconnect plugs; the second opening exposes the backside electrode metal layer located at the bottom; any of the backside electrode metal layers in the backside electrode is connected to a respective metal electrode by a respective first interconnect plug.

[Claim 9] An electro-optic modulator, characterized in that it comprises:

a lithium niobate thin film;

a covering dielectric layer located on the lithium niobate thin film;

a waveguide located in the covering dielectric layer and directly above the lithium niobate thin film;

two bottom electrodes located in the covering dielectric layer and on two opposite sides of the waveguide and having a spacing from the waveguide;

two metal electrodes located in the covering dielectric layer, and further located on and connected to respective bottom electrodes;

a supporting substrate located on a surface of the covering dielectric layer distant from the lithium niobate thin film;

a first dielectric layer located on a surface of the lithium niobate thin film distant from the covering dielectric layer;

a bonding substrate located on a surface of the first dielectric layer distant from the lithium niobate thin film; and

a second dielectric layer located on a surface of the covering dielectric layer distant from the supporting substrate; the second dielectric layer having formed in it a first opening, the first opening exposing the waveguide, a portion of each bottom electrode, and a portion of the covering dielectric layer; the lithium niobate thin film being located in the first opening.

[Claim 10] The electro-optic modulator according to claim 9, characterized in that the lithium niobate thin film and the covering dielectric layer are combined together by way of bonding.

[Claim 11] The electro-optic modulator according to claim 9, characterized in that a bonding layer that bonds together the lithium niobate thin film and the covering dielectric layer is disposed between the lithium niobate thin film and the covering dielectric layer.

[Claim 12] The electro-optic modulator according to claim 9, characterized in that two backside electrodes are disposed on a surface of the second dielectric layer distant from the covering dielectric layer, the backside electrodes being electrically connected to the metal electrodes respectively.

[Claim 13] The electro-optic modulator according to any one of claims 9 through 12, characterized in that there are a plurality of the bottom electrodes, a plurality of the metal electrodes, and a plurality of the waveguides, the waveguides being located between the metal electrodes that are adjacent; orthographic projections of all of the waveguides onto a plane in which the lithium niobate thin film is located are on a surface of the lithium niobate thin film