CLAIMS

1. A structure for an optoelectronics platform comprising:

a substrate, and

a $BaTiO_3$, BTO, film deposited on a surface of the substrate and having a thickness suitable for single mode operation with one or more possible polarization configurations with optical confinement in the BTO film at a wavelength range of operation from about 400nm to 1600nm;

wherein the substrate provides vertical refractive index confinement in a direction perpendicular to the surface of the substrate for the single mode operation optical confinement in the BTO film at the wavelength or wavelength range of operation; and

wherein the substrate comprises one of a group consisting of $La_{0.3}Sr_{0.7}Al_{0.65}Ta_{0.35}O_3$ (LSAT), $LaSrAlO_4$ (LSAO), $DyScO_3$, $GdScO_3$, $SmScO_3$, $TbScO_3$, $NdScO_3$, $HoScO_3$, $ErScO_3$, $TmScO_3$, $YbScO_3$, $LuScO_3$, $PrScO_3$, $LaScO_3$, $YScO_3$.

2. The structure of claim 1, wherein the BTO is in a relaxed state in which the strain is partially or fully relaxed from a fully strained BTO crystal.

3. The structure of claims 1 or 2, wherein the BTO film is formed into a BTO waveguide on the surface of the substrate.

4. The structure of claim 3, wherein the BTO waveguide is in the form of a BTO rib waveguide on the surface of the substrate.

5. The structure of claims 3 or 4, incorporated into a Mach-Zehnder modulator configuration.

6. The structure of any one of claims 3 to 5, further comprising an electrode formed on the surface of the substrate on each side of the BTO waveguide.

7. The structure of any one of claims 3 to 6, further comprising a polarization filter at an output end of the BTO waveguide.

8. The structure of claim 7, wherein the BTO waveguide is configured such that an electric field can be applied along an axis perpendicular to the c-axis of the BTO waveguide for controlling polarization of light propagating in the BTO waveguide with a polarization in plane oriented to be the same as the axis perpendicular to the c-axis.

9. The structure of claim 8, incorporated a polarization-based light modulator.

10. A method of fabricating a structure for an optoelectronics platform, the method comprising the steps of :

providing a substrate, and

depositing a $BaTiO_3$, BTO, film on a surface of the substrate and having a thickness suitable for single mode operation with one or more possible polarization configurations with optical confinement in the BTO film at a wavelength range of operation from about 400nm to 1600nm;

wherein the substrate is chosen to provide vertical refractive index confinement in a direction perpendicular to the surface of the substrate for the single mode operation optical confinement in the BTO film at the wavelength or wavelength range of operation; and

wherein the substrate comprises one of a group consisting of $La_{0.3}Sr_{0.7}Al_{0.65}Ta_{0.35}O_3$ (LSAT), $LaSrAlO_4$ (LSAO), DyScO3, $GdScO_3$, $SmScO_3$, $TbScO_3$, $NdScO_3$, $HoScO_3$, $ErScO_3$, $TmScO_3$, $YbScO_3$, $LuScO_3$, $PrScO_3$, $LaScO_3$, $YScO_3$.

11. The method of claim 10, wherein the BTO is deposited to be in a relaxed state in which the strain is partially or fully relaxed from a fully strained BTO crystal.

12. The method of claims 10 or 11, wherein the BTO film is formed into a BTO waveguide on the surface of the substrate.

13. The method of claim 12, wherein the BTO waveguide is formed as a BTO rib waveguide on the surface of the substrate.

14. The method of claims 12 or 13, comprising incorporating the structure into a Mach-Zehnder modulator configuration.

15. The method of any one of claims 12 to 14, further comprising forming an electrode on the surface of the substrate on each side of the BTO waveguide.

16. The method of any one of claims 12 to 15, further comprising providing a polarization filter at an output end of the BTO waveguide.

17. The method of claim 16, further comprising configuring the BTO waveguide such that an electric field can be applied along an axis perpendicular to the c-axis of the BTO waveguide for controlling polarization of light propagating in the BTO waveguide with a polarization in plane oriented to be the same as the axis perpendicular to the c-axis.

18. The method of claim 17, comprising incorporating the structure into a polarization-based light modulator.

19. The method of any one of claims 10 to 18, further comprising the steps of:

depositing a first mask layer on the BTO film;

depositing a resist layer on the first mask layer;

patterning the resist layer;

developing the resist layer to form a second mask layer;

removing portions of the first mask layer not covered by the second mask layer so as to provide a double-layer mask for processing of the BTO film.

20. The method of claim 19, wherein the first mask layer comprises a metal, such as chromium.

21. The method of claim 20, wherein the metal layer is deposited via electron beam evaporator.

22. The method of any one of claims 19 to 21, wherein the resist layer is patterned via electron beam lithography.

23. The method of any one of claim 19 to 22, wherein the portions of the first mask layer are removed by wet etching.

24. The method of any one of claims 19 to 23, further comprising the processing of the BTO film.

25. The method of claim 24, wherein the further processing comprises ion milling, RIE etching or ICP etching.