Claims

[Claim 1] A field-effect transistor comprising:

a source electrode and a drain electrode;

a gate electrode;

a semiconductor layer; and

a gate insulating layer,

wherein the gate insulating layer is an oxide insulator film including A element and B element, the A element being one or more selected from the group consisting of Zr and Hf and the B element being one or more selected from the group consisting of Be and Mg, and wherein the oxide insulator film is an oxide insulator film of a (Be, Mg)O-(Zr, Hf)O_2-system, where the oxide insulator film is free from a perovskite phase and a layered perovskite phase.

[Claim 2] The field-effect transistor according to claim 1, wherein the semiconductor layer is an oxide semiconductor.

[Claim 3] The field-effect transistor according to claim 1 or 2, wherein the oxide insulator film further includes C element that is one or more selected from the group consisting of Sc, Y, and Ln (lanthanoid).

[Claim 4] The field-effect transistor according to claim 3, wherein mol% of the A element is equal to or greater than mol% of the C element in the oxide insulator film.

[Claim 5] The field-effect transistor according to claim 1 or 2, wherein mol% of the A element is equal to or greater than mol% of the B element in the oxide insulator film.

[Claim ~~4~~6] The field-effect transistor according to any one of claims 1 to ~~3~~5, wherein an electron configuration of d orbital of a metal ion included in the oxide insulator film is d^0 or d^{10}.

[Claim ~~5~~7] An oxide insulator film comprising:

A element that is one or more selected from the group consisting of Zr and Hf; and

B element that is one or more selected from the group consisting of Be and Mg.

wherein the oxide insulator film is an oxide insulator film of a (Be, Mg)O-(Zr, Hf)O_2-system, where the oxide insulator film is free from a perovskite phase and a layered perovskite phase.

[Claim ~~6~~8] The oxide insulator film according to claim ~~5~~7, further comprising

C element that is one or more selected from the group consisting of Sc, Y, and Ln (lanthanoid).

[Claim 9] The oxide insulator film according to claim 8, wherein mol% of the A element is equal to or greater than mol% of the C element in the oxide insulator film.

[Claim 10] The oxide insulator film according to claim 7, wherein mol% of the A element is equal to or greater than mol% of the B element in the oxide insulator film.

[Claim ~~7~~11] A coating liquid for forming ~~a~~ the ~~metal~~ oxide insulator film according to claim 7, the coating liquid comprising:

A element that is one or more selected from the group consisting of Zr and Hf; and

B element that is one or more selected from the group consisting of Be and Mg, wherein mol% of the A element is equal to or greater than mol% of the B element in the coating liquid.

[Claim ~~8~~12] The coating liquid for forming a metal oxide film according to claim ~~7~~11,

further comprising C element that is one or more selected from the group consisting of Sc, Y, and Ln (lanthanoid), wherein mol% of the A element is equal to or greater than mol% of the C element in the coating liquid.

[Claim ~~9~~13] The coating liquid for forming a metal oxide film according to claim ~~7~~ 11 or ~~8~~12, further comprising a solvent.

[Claim ~~10~~14] A display element comprising:

an optical control element configured to control light output according to a driving signal; and

a driving circuit that includes the field-effect transistor according to any one of claims 1 to ~~4~~ 6 and is configured to drive the optical control element.

[Claim ~~11~~15] The display element according to claim ~~10~~14, wherein the optical control element includes an electroluminescent element, an electrochromic element, a liquid crystal element, an electrophoretic element, or an electrowetting element.

[Claim ~~12~~16] An image display device configured to display an image corresponding to image data, the image display device comprising:

a plurality of display elements arranged in a form of matrix, each of the plurality of display elements being the display element according to claim ~~10~~ 14 or ~~11~~15;

a plurality of wired lines configured to individually apply gate voltage to field-effect transistors in the plurality of display elements; and

a display control device configured to individually control the gate voltage of the field-effect transistors via the plurality of wired lines correspondingly to the image data.

[Claim ~~13~~17] A system comprising:

the image display device according to claim ~~12~~16; and

an image-data-generating device configured to generate image data based on image information to be displayed and to output the image data to the image display device.

[Claim ~~14~~18] A method for producing an oxide insulator film, the method comprising:

coating the coating liquid for forming a metal oxide film according to any one of claims ~~7~~ 11 to ~~9~~ 13 on an object to be coated, and drying the coating liquid, followed by baking.

[Claim ~~15~~19] A method for producing a field-effect transistor including a source electrode and a drain electrode, a gate electrode, a semiconductor layer, and a gate insulating layer, the method comprising:

coating the coating liquid for forming a metal oxide film according to any one of claims ~~7~~ 11 to ~~9~~ 13 to form the gate insulating layer.