CLAIMS

1. A method for manufacturing a field effect transistor that includes a gate insulating layer and an electrode including a first conductive film and a second conductive film successively laminated on a predetermined surface of the gate insulating layer, the method comprising steps of:

forming an oxide film including element A, which is an alkaline earth metal, and element B, which is at least one element selected from a group consisting of Ga, Sc, Y and a lanthanide, as the gate insulating layer;

forming a first conductive film on the oxide film;

forming a second conductive film on the first conductive film;

etching the second conductive film with an etching solution having a higher etch rate for the second conductive film as compared with an etch rate for the first conductive film; and

etching the first conductive film by dissolving the first conductive film with an organic alkaline solution and using the second conductive film as a mask.

2. The method for manufacturing a field effect transistor according to claim 1, the method further comprising steps of:

forming a third conductive film on the second conductive film; and

etching the third conductive film with an etching solution having a higher etch rate for the third conductive film as compared with an etch rate for the second conductive film;

wherein, in the step of etching the first conductive film, the first conductive film is etched with the organic alkaline solution using the second conductive film and the third conductive film as masks.

3. A method for manufacturing a field effect transistor that includes a gate insulating layer and an electrode including a first conductive film and a second conductive film successively laminated on a predetermined surface of the gate insulating layer, the method comprising steps of:

forming an oxide film including element A,

which is an alkaline earth metal, and element B, which is at least one element selected from a group consisting of Ga, Sc, Y and a lanthanide, as the gate insulating layer;

forming a first conductive film on the oxide film;

forming a second conductive film on the first conductive film;

forming a third conductive film on the second conductive film;

etching the third conductive film with an etching solution having a higher etch rate for the third conductive film as compared with an etch rate for the second conductive film; and

simultaneously etching the first conductive film and the second conductive film by dissolving the first conductive film and the second conductive film with the organic alkaline solution and using the third conductive film as a mask.

4. The method for manufacturing a field effect transistor according to claim 1, wherein

the first conductive film is a metal film including Al; and

the second conductive film is a metal film including at least one of Mo, W, Ti, Ta, Cr, Cu, and Ni.

5. The method for manufacturing a field effect transistor according to claim 2, wherein

the first conductive film is a metal film including Al;

the second conductive film is a metal film including at least one of Mo, W, Ta, Cr, Au, Cu, and Ni; and

the third conductive film is a metal film including Ti.

6. The method for manufacturing a field effect transistor according to claim 3, wherein

the first conductive film is a metal film including Al;

the second conductive film is a metal film including Cu; and

the third conductive film is a metal film including Ti.

7. The method for manufacturing a field effect transistor according to any one of claims 1-6, wherein the oxide film includes a paraelectric amorphous oxide or consists of the paraelectric amorphous oxide.

8. The method for manufacturing a field effect transistor according to any one of claims 1-7, wherein the oxide film further includes element C, which is at least one element selected from a group consisting of Al, Ti, Zr, Hf, Nb, and Ta.

9. A field effect transistor comprising:

a base material;

a source electrode, a drain electrode, and a gate electrode that are formed on the base material;

an active layer that forms a channel between the source electrode and the drain electrode when a predetermined voltage is applied to the gate electrode; and

a gate insulating layer arranged between the gate electrode and the active layer;

wherein the gate insulating layer is made of an oxide film including element A, which is an alkaline earth metal, and element B, which is at least one element selected from a group consisting of Ga, Sc, Y, and a lanthanide; and

wherein at least one electrode from among the source electrode, the drain electrode, and the gate electrode that is formed on a predetermined surface of the gate insulating layer is a laminated film including

a first conductive film that is formed on the oxide film, wherein the first conductive film is dissolvable in an organic alkaline solution such that an etch rate of the organic alkaline solution for etching the first conductive film is higher than an etch rate of the organic alkaline solution for etching the gate insulating layer to prevent etching damage to the gate insulating layer when the first conductive film is etched, and

a second conductive film that is formed on the first conductive film, wherein the second conductive film is dissolvable in a predetermined etching solution such that an etch rate of the predetermined solution for etching the second conductive film is higher than an etch rate of the predetermined etching solution

for etching the first conductive film.

10. The field effect transistor according to claim 9, wherein

the laminated film includes a third conductive film that is formed on the second conductive film, an etch rate of the predetermined etching solution for etching the third conductive film being higher than the etch rate of the predetermined etching solution for etching the second conductive film.

11. A field effect transistor comprising:

a base material;

a source electrode, a drain electrode, and a gate electrode that are formed on the base material;

an active layer that forms a channel between the source electrode and the drain electrode when a predetermined voltage is applied to the gate electrode; and

a gate insulating layer arranged between the gate electrode and the active layer;

wherein the gate insulating layer is made of

an oxide film including element A, which is an alkaline earth metal, and element B, which is at least one element selected from a group consisting of Ga, Sc, Y, and a lanthanide; and

wherein at least one electrode from among the source electrode, the drain electrode, and the gate electrode that is formed on a predetermined surface of the gate insulating layer is a laminated film including

a first conductive film that is formed on the oxide film, wherein the first conductive film is dissolvable in an organic alkaline solution such that an etch rate of the organic alkaline solution for etching the first conductive film is higher than an etch rate of the organic alkaline solution for etching the gate insulating layer to prevent etching damage to the gate insulating layer when the first conductive film is etched, and

a second conductive film that is formed on the first conductive film, wherein the second conductive film is dissolvable in an organic alkaline solution such that an etch rate of the organic alkaline solution for etching the second conductive film is higher than an etch rate of the organic alkaline solution for etching the gate insulating layer to

prevent etching damage to the gate insulating layer when the first conductive film and the second conductive film are simultaneously etched,

wherein the laminated film includes a third conductive film that is formed on the second conductive film, an etch rate of a predetermined etching solution for etching the third conductive film being higher than the etch rate of the predetermined etching solution for etching the second conductive film, wherein the third conductive film is usable as a mask when the first conductive film and the second conductive film are simultaneously etched.

12. The field effect transistor according to claim 9, wherein

the first conductive film is a metal film including Al; and

the second conductive film is a metal film including at least one of Mo, W, Ti, Ta, Cr, Cu, and Ni.

13. The field effect transistor according to claim 10, wherein

the first conductive film is a metal film

including Al;

the second conductive film is a metal film including at least one of Mo, W, Ta, Cr, Au, Cu, and Ni; and

the third conductive film is a metal film including Ti.

14. The field effect transistor according to claim 11, wherein

the first conductive film is a metal film including Al;

the second conductive film is a metal film including Cu; and

the third conductive film is a metal film including Ti.

15. The field effect transistor according to any one of claims 9-14, wherein the oxide film includes a paraelectric amorphous oxide or consists of the paraelectric amorphous oxide.

16. The field effect transistor according

to any one of claims 9-15, wherein the oxide film further includes element C, which is at least one element selected from a group consisting of Al, Ti, Zr, Hf, Nb, and Ta.

17. The field effect transistor according to any one of claims 9-16, wherein the active layer is an oxide semiconductor.

18. A display element comprising:

a drive circuit; and

a light control element that is controlled to output light based on a drive signal from the drive circuit;

wherein the drive circuit drives the light control element using the field effect transistor according to any one of claims 9 to 17.

19. The display element according to claim 18, wherein the light control element is an electroluminescent element, an electrochromic element, a liquid crystal element, an electrophoretic element,

or an electrowetting element.

20. A display device comprising:

a plurality of the display elements according to claim 18 or 19 that are arranged into a matrix; and

a display control device configured to individually control the plurality of display elements.

21. A system comprising:

the display device according to claim 20; and

an image data generating device configured to supply image data to the display device.