

[CLAIMS]

[Claim 1]

A coating liquid for forming an n-type oxide semiconductor film, the coating liquid comprising:

- 5 a Group A element, which is at least one selected from the group consisting of Zr, Hf, Ce, Si, and Ge;
- a Group B element, which is at least one selected from the group consisting of Ti, Sn, and Pb;
- a Group C element, which is at least one selected from the group
- 10 consisting of Group 5 elements, Group 6 elements, Group 7 elements, Group 8 elements, Group 9 elements, Group 10 elements, Group 15 elements, and Group 16 elements,
- wherein the Group C element comprises at least one selected from Mo, W, Re, Ru, Nb, Ta, Os, and Sb; and
- 15 a solvent.

[Claim 2]

The coating liquid for forming an n-type oxide semiconductor film according to claim 1,

- wherein a total number of atoms of the Group A element (NA) and a total
- 20 number of atoms of the Group B element (NB) satisfy Formula (1) below:

[Math. 1]

$$0.02 \leq [NA/NB] \leq 0.2 \quad \text{Formula (1)} \quad .$$

[Claim 3]

The coating liquid for forming an n-type oxide semiconductor film

- 25 according to claim 1 or 2,

wherein a total number of atoms of the Group C element (NC) and a total number of atoms of the Group B element (NB) satisfy Formula (2) below:

[Math. 2]

$$0.0001 \leq [NC/NB] \leq 0.05 \quad \text{Formula (2)} \quad .$$

5 [Claim 4]

The coating liquid for forming an n-type oxide semiconductor film according to any one of claims 1 to 3, wherein the solvent comprises an organic solvent.

[Claim 5]

10 The coating liquid for forming an n-type oxide semiconductor film according to claim 4,

wherein the organic solvent comprises at least one selected from the group consisting of organic acids, organic acid esters, aromatic compounds, diols, glycol ethers, and aprotic polar solvents.

15 [Claim 6]

A method for producing an n-type oxide semiconductor film, the method comprising:

coating the coating liquid for forming an n-type oxide semiconductor film according to any one of claims 1 to 5 on an object to be coated; and

20 drying the object and baking the object after the drying.

[Claim 7]

A method for producing a field-effect transistor, the method comprising:

forming a gate electrode on a substrate;

forming a gate insulating layer on the gate electrode;

25 forming a source electrode and a drain electrode on the gate insulating

layer to be spaced from each other; and

forming an active layer on the gate insulating layer, and in a channel

region between the source electrode and the drain electrode, the active

layer being formed of an n-type oxide semiconductor,

- 5 wherein the forming the active layer is coating the coating liquid for
forming an n-type oxide semiconductor film according to any one of claims
1 to 5 on the gate insulating layer to form the active layer formed of the
n-type oxide semiconductor.

[Claim 8]

- 10 A method for producing a field-effect transistor, the method comprising:
forming a source electrode and a drain electrode on a substrate to be
spaced from each other;
forming an active layer on the substrate and in a channel region between
the source electrode and the drain electrode, the active layer being formed
15 of an n-type oxide semiconductor;
forming a gate insulating layer on the active layer; and
forming a gate electrode on the gate insulating layer,
wherein the forming the active layer is coating the coating liquid for
forming an n-type oxide semiconductor film according to any one of claims
20 1 to 5 on the substrate to form the active layer formed of the n-type oxide
semiconductor.

[Claim 9]

The method for producing a field-effect transistor according to claim 11 or
8,

- 25 wherein, the forming the active layer comprises adjusting, in the coating

- liquid for forming an n-type oxide semiconductor film, a total number of atoms of the Group A (NA), a total number of atoms of the Group B (NB), and a total number of atoms of the Group C (NC) to control at least one selected from the group consisting of volume resistivity, carrier mobility,
- 5 and carrier density of the n-type oxide semiconductor.

[Claim 10]

An n-type oxide semiconductor film, which is a baked product of the coating liquid for forming an n-type oxide semiconductor film according to any one of claims 1 to 5.

- 10 [Claim 11]

A semiconductor element comprising
an active layer including the n-type oxide semiconductor film according to claim 10.

[Claim 12]

- 15 The semiconductor element according to claim 11,
wherein the semiconductor element is a diode.

[Claim 13]

A field-effect transistor comprising:

a gate electrode;

- 20 a source electrode and a drain electrode;

an active layer formed between the source electrode and the drain electrode, and being formed of an n-type oxide semiconductor film; and
a gate insulating layer formed between the gate electrode and the active layer,

- 25 wherein the n-type oxide semiconductor film is the n-type oxide

semiconductor film according to claim 10.