[CLAIMS]

What is claimed is:

[Claim 1]

A catalyst comprising at least:

molybdenum;

antimony;

bismuth; and

iron,

wherein a ratio of the number of antimony atoms to the number of molybdenum atoms on a catalyst surface is greater than a ratio of the number of antimony atoms to the number of molybdenum atoms in an entire catalyst,

when a ratio of an amount of the antimony atoms to an amount of the molybdenum atoms calculated by inductively coupled high frequency plasma (ICP) emission spectroscopy is represented by A, and a ratio of a peak area of the antimony atoms to a peak area of the molybdenum atoms that are measured by X-ray photoelectron spectroscopy is represented by B, B/A is 1.2 or more and 10.0 or less,

the catalyst is a catalyst for producing an unsaturated aldehyde and/or an unsaturated carboxylic acid, and

the catalyst composition is represented by the following formula (1),

$$Mo_aBi_bFe_cSb_dM_eX_fY_gSi_hO_i \quad (1)$$

in the formula (1), Mo, Bi, Fe, Sb, Si, and O each represent molybdenum, bismuth, iron, antimony, silicon, or oxygen, M represents at least one element selected from the group consisting of cobalt and nickel, X represents at least one element selected from the group consisting of zinc, chromium, lead, manganese, calcium, magnesium, niobium, silver, barium, tin, tantalum, tungsten, phosphorus, boron, sulfur, selenium, tellurium, cerium, and titanium, Y represents at least one element selected

from the group consisting of cesium, lithium, sodium, potassium, rubidium, and thallium, a, b, c, d, e, f, g, h, and i represent an atom ratio of each element, when a is set to 12, b is 0.01 to 3.00, c is 0.01 to 5.00, d is 0.01 to 5.00, e is 0.00 to 12.00, f is 0.00 to 8.00, g is 0.001 to 2.00, and h is 0.00 to 20.00, and i is an oxygen atom ratio necessary to satisfy a valence of each component).

[Claim 2]

The catalyst according to Claim 1,

wherein a value of the A is 0.04 or more and 0.20 or less.

[Claim 3]

The catalyst according to Claim 1 or 2,

wherein a value of the B is 0.05 or more and 0.50 or less.

[Claim 4]

A method for producing an unsaturated aldehyde and/or an unsaturated carboxylic acid by a gas-phase oxidation reaction of an organic compound in the presence of the catalyst according to any one of Claims 1 to 3.

[Claim 5]

A method for producing a catalyst containing at least molybdenum and antimony, the method comprising:

a step of mixing at least a molybdenum compound, an antimony compound, and a dispersant; and

a step of producing a catalyst by calcination,

wherein, in the mixing step, the dispersant is added before the antimony compound is dissolved,

the dispersant is a hydrazine compound,

when a ratio of an amount of the antimony atoms to an amount of the molybdenum atoms calculated by inductively coupled high frequency plasma (ICP) emission spectroscopy

is represented by A, and a ratio of a peak area of the antimony atoms to a peak area of the molybdenum atoms that are measured by X-ray photoelectron spectroscopy is represented by B, B/A is 1.2 or more and 10.0 or less,

the catalyst is a catalyst for producing an unsaturated aldehyde and/or an unsaturated carboxylic acid, and

the catalyst composition is represented by the following formula (1),

$Mo_aBi_bFe_cSb_dM_eX_fY_gSi_hO_i$ (1)

in the formula (1), Mo, Bi, Fe, Sb, Si, and O each represent molybdenum, bismuth, iron, antimony, silicon, or oxygen, M represents at least one element selected from the group consisting of cobalt and nickel, X represents at least one element selected from the group consisting of zinc, chromium, lead, manganese, calcium, magnesium, niobium, silver, barium, tin, tantalum, tungsten, phosphorus, boron, sulfur, selenium, tellurium, cerium, and titanium, Y represents at least one element selected from the group consisting of cesium, lithium, sodium, potassium, rubidium, and thallium, a, b, c, d, e, f, g, h, and i represent an atom ratio of each element, when a is set to 12, b is 0.01 to 3.00, c is 0.01 to 5.00, d is 0.01 to 5.00, e is 0.00 to 12.00, f is 0.00 to 8.00, g is 0.001 to 2.00, and h is 0.00 to 20.00, and i is an oxygen atom ratio necessary to satisfy a valence of each component).

[Claim 6]

The method for producing a catalyst according to Claim 5,

wherein the antimony compound has a particle size of 0.21 μm or more and 7.90 μm or less.