CLAIMS

1. A catalyst molded body used in producing an unsaturated aldehyde and/or an unsaturated carboxylic acid by an oxidation reaction, wherein the catalyst molded body simultaneously satisfies the following requirements (A) and (B):

(A) A molded body density of the catalyst molded body is 2.25 g/mL or less in a state before being filled into a reactor;

(B) The catalyst molded body satisfies ~~at least one of~~ the following requirements (B-1) and (B-2):

(B-1) An arithmetic average roughness (Ra) defined by JIS B-0601-2001 of a surface of the catalyst molded body is 3.0 μm or less;

(B-2) A maximum height (Rz) defined by JIS B-0601-2001 of a surface of the catalyst molded body is 15 μm or less.

2. The catalyst molded body according to claim 1, wherein the catalyst molded body has a coating layer of organic polymer compounds on at least a part of the surface.

3. The catalyst molded body according to claim 2, wherein the organic polymer compounds are contained in an amount of 0.001 to 2% by mass.

4. The catalyst molded body according to any one of claims 1 to 3, wherein the molded body is an extruded molded body.

5. The catalyst molded body according to any one of claims 1 to 4, comprising a catalyst component having a composition represented by the following formula (I):

$$Mo_{a1}Bi_{b1}Fe_{c1}A_{d1}E1_{e1}G1_{f1}J1_{g1}Si_{h1}(NH_4)_{i1}O_{j1} \quad (I)$$

(In formula (I), Mo, Bi, Fe, Si, NH_4, and O represent molybdenum, bismuth, iron, silicon, ammonium species, and oxygen, respectively; A represents at least one element selected from the group consisting of cobalt and nickel; E1 represents at least one element selected from the group consisting of chromium, lead, manganese, calcium, magnesium, niobium, silver, barium, tin, thallium, tantalum, and zinc; G1 represents at least one element selected from the group consisting of phosphorus, boron, sulfur, selenium, tellurium, cerium, tungsten, antimony, and titanium; J1 represents at least one element selected from the group consisting of lithium, sodium, potassium, rubidium, and cesium; and a1, b1, c1, d1, e1, f1, g1, h1, i1, and j1 represent a molar ratio of each component, and when a1 = 12, b1 = 0.01-3, c1 = 0.01-5, d1 = 0.01-12, e1 = 0-8, f1 = 0-5, g1 = 0.001-2, h1 = 0-20, i1 = 0-30, and j1 is a molar ratio of oxygen required to satisfy the valence of each above component.)

6. The catalyst molded body according to any one of claims 1 to 4, comprising a catalyst component having a composition represented by the following formula (II):

$$P_{a2}Mo_{b2}V_{c2}Cu_{d2}E2_{e2}G2_{f2}J2_{g2}(NH_4)_{h2}O_{i2} \quad (II)$$

(In formula (II), P, Mo, V, Cu, NH_4, and O represent phosphorus, molybdenum, vanadium, copper, ammonium species, and oxygen, respectively; E2 represents at least one element selected from the group consisting of antimony, bismuth, arsenic, germanium, zirconium, tellurium, silver, selenium, silicon, tungsten, and boron; G2 represents at least one element selected from the group consisting of iron, zinc, chromium, magnesium, calcium, strontium, tantalum, cobalt, nickel, manganese, barium, titanium, tin, thallium, lead, niobium, indium, sulfur, palladium, gallium, cerium, and lanthanum; J2 represents at least one element selected from the group consisting of potassium, rubidium, and cesium; and a2, b2, c2, d2, e2, f2, g2, h2, and i2 represent a molar ratio of each component, and when b2 = 12, a2 = 0.1-3, c2 = 0.01-3, d2 = 0.01-2, e2 = 0-3, f2 = 0-3, g2 = 0.01-3, h2 = 0-30, and i2 is a molar ratio of oxygen required to satisfy the valence of each above

component).

7. A method for producing an unsaturated aldehyde and an unsaturated carboxylic acid, wherein propylene, isobutylene, primary butyl alcohol, tertiary butyl alcohol or methyl tertiary butyl ether is subjected to a gas phase catalytic oxidation with molecular oxygen in the presence of the catalyst molded body according to claim 5.

8. A method for producing an unsaturated carboxylic acid, wherein (meth)acrolein is subjected to a gas phase catalytic oxidation with molecular oxygen in the presence of the catalyst molded body according to claim 6.

9. A method for producing an unsaturated carboxylic acid ester, wherein the unsaturated carboxylic acid produced by the method according to claim 7 or 8 is esterified.

10. A method for producing an unsaturated carboxylic acid ester, comprising the steps of: producing an unsaturated carboxylic acid by the method according to claim 7 or 8; and esterifying the unsaturated carboxylic acid.