[Claims]

[Claim 1]

A metal oxide catalyst, which has a bulk composition represented by formula (1) below and which is used to produce a conjugated diolefin by an oxidative dehydrogenation reaction between a monoolefin, having 4 or more carbon atoms, and molecular oxygen, wherein

a standard deviation obtained by dividing a ratio of Bi molar concentration relative to Mo molar concentration at the surface of a catalyst particle by a ratio of the Bi molar concentration relative to the Mo molar concentration in a catalyst bulk is 0.3 or less:

$$Mo_{12}Bi_pFe_qA_aB_bC_cD_dE_eF_fO_x \quad (1)$$

(In the formula, A is at least one type of element selected from the group consisting of Ni and Co, B is at least one type of element selected from among alkali metal elements, C is at least one type of element selected from the group consisting of Mg, Ca, Sr, Ba, Zn and Mn, D is at least one type of rare earth element, E is at least one type of element selected from the group consisting of Cr, In and Ga, F is at least one type of element selected from the group consisting of Si, Al, Ti and Zr, O is oxygen, p, q, a, b, c, d, e, f and x denote the number of atoms of Bi, Fe, A, B, C, D, E, F and oxygen, respectively, relative to 12 Mo atoms, and are such that $0.1 \leq p \leq 5$, $0.5 \leq q \leq 8$, $0 \leq a \leq 10$, $0.02 \leq b \leq 2$, $0 \leq c \leq 5$, $0 \leq d \leq 5$, $0 \leq e \leq 5$ and $0 \leq f \leq 200$, and x is the number of oxygen atoms required to satisfy valency requirement of other elements present.)

[Claim 2]

The metal oxide catalyst according to claim 1, wherein the standard deviation is 0.2 or less and p in formula (1) is such that $0.15 \leq p \leq 3$.

[Claim 3]

A method for producing a conjugated diolefin by an oxidative dehydrogenation

reaction between a monoolefin, having 4 or more carbon atoms, and molecular oxygen by using the metal oxide catalyst according to claim 1 or claim 2.

[Claim 4]

The method for producing a conjugated diolefin according to claim 3, wherein the monoolefin is n-butene and the conjugated diolefin is 1,3-butadiene.

[Claim 5]

The method for producing a conjugated diolefin according to claim 3 or claim 4, wherein the oxidative dehydrogenation reaction is carried out as a fluidized bed reaction.

[Claim 6]

A method for producing a metal oxide catalyst, which has a bulk composition represented by formula (1) below and which is used to produce a conjugated diolefin by an oxidative dehydrogenation reaction between a monoolefin, having 4 or more carbon atoms, and molecular oxygen,

the method comprising:

(i) a step of preparing a Mo-containing liquid that contains at least Mo and a Bi-containing liquid that contains at least Bi,

(ii) a step of continuously supplying the Mo-containing liquid to a first flow path, continuously supplying the Bi-containing liquid to a second flow path, and merging the first flow path and the second flow path at a point further downstream than the positions, where the Mo-containing liquid and the Bi-containing liquid are supplied respectively, thereby mixing the Mo-containing liquid and the Bi-containing liquid and obtaining a Mo-Bi-containing liquid, and

(iii) a step of drying the Mo-Bi-containing liquid, the method further comprising the step of:

(v) storing the Mo-Bi-containing liquid between the step (ii) and the step (iii), wherein:

a treatment including in series the steps (i), (ii) and (v) is carried out using a batch type treatment system, the entire amount of a batch of the Mo-Bi-containing

liquid obtained in the step (ii) is stored in the step (v); and

in the step (ii), when mass supply rates of the Mo-containing liquid and the Bi-containing liquid to the first flow path and the second flow path are denoted by mA (g/min) and mB (g/min) respectively, at least 60 mass% of the total supplied amounts MA (g) and MB (g) per batch of the Mo-containing liquid and the Bi-containing liquid are supplied in such a way as to satisfy formula (3):

$$(mB/mA)/(MB/MA) = 0.5 \text{ to } 1.5 \quad (3):$$

$$Mo_{12}Bi_pFe_qA_aB_bC_cD_dE_eF_fO_x \quad (1)$$

(In the formula, A is at least one type of element selected from the group consisting of Ni and Co, B is at least one type of element selected from among alkali metal elements, C is at least one type of element selected from the group consisting of Mg, Ca, Sr, Ba, Zn and Mn, D is at least one type of rare earth element, E is at least one type of element selected from the group consisting of Cr, In and Ga, F is at least one type of element selected from the group consisting of Si, Al, Ti and Zr, O is oxygen, p, q, a, b, c, d, e, f and x denote the number of atoms of Bi, Fe, A, B, C, D, E, F and oxygen, respectively, relative to 12 Mo atoms, and are such that $0.1 \leq p \leq 5$, $0.5 \leq q \leq 8$, $0 \leq a \leq 10$, $0.02 \leq b \leq 2$, $0 \leq c \leq 5$, $0 \leq d \leq 5$, $0 \leq e \leq 5$ and $0 \leq f \leq 200$, and x is the number of oxygen atoms required to satisfy valency requirement of other elements present.)

[Claim 7]

The method for producing a metal oxide catalyst according to claim 6, further comprising the step of:

(iv) further mixing the Mo-Bi-containing liquid between the step (ii) and the step (iii).

[Claim 8]

A method for producing a metal oxide catalyst, which has a bulk composition represented by formula (1) below and which is used to produce a conjugated diolefin by an oxidative dehydrogenation reaction between a monoolefin, having 4 or more carbon atoms, and molecular oxygen,

the method comprising:

(i) a step of preparing a Mo-containing liquid that contains at least Mo and a Bi-containing liquid that contains at least Bi,

(ii) a step of continuously supplying the Mo-containing liquid to a first flow path, continuously supplying the Bi-containing liquid to a second flow path, and merging the first flow path and the second flow path at a point further downstream than the positions, where the Mo-containing liquid and the Bi-containing liquid are supplied respectively, thereby mixing the Mo-containing liquid and the Bi-containing liquid and obtaining a Mo-Bi-containing liquid, and

(iii) a step of drying the Mo-Bi-containing liquid, wherein:

the Mo-Bi-containing liquid is continuously supplied for the step (iii); and

in the step (ii), when molar supply rates of the Mo-containing liquid and the Bi-containing liquid to the first flow path and the second flow path are denoted by mα (mol/min) and mβ (mol/min) respectively,

the Mo-containing liquid and Bi-containing liquid are supplied in such a way as to satisfy formula (4):

$$(m\beta/m\alpha)/(p/12) = 0.8 \text{ to } 1.2 \qquad (4):$$

$$Mo_{12}Bi_pFe_qA_aB_bC_cD_dE_eF_fO_x \qquad (1)$$

(In the formula, A is at least one type of element selected from the group consisting of Ni and Co, B is at least one type of element selected from among alkali metal elements, C is at least one type of element selected from the group consisting of Mg, Ca, Sr, Ba, Zn and Mn, D is at least one type of rare earth element, E is at least one type of element selected from the group consisting of Cr, In and Ga, F is at least one type of element selected from the group consisting of Si, Al, Ti and Zr, O is oxygen, p, q, a, b, c, d, e, f and x denote the number of atoms of Bi, Fe, A, B, C, D, E, F and oxygen, respectively, relative to 12 Mo atoms, and are such that $0.1 \leq p \leq 5$, $0.5 \leq q \leq 8$, $0 \leq a \leq 10$, $0.02 \leq b \leq 2$, $0 \leq c \leq 5$, $0 \leq d \leq 5$, $0 \leq e \leq 5$ and $0 \leq f \leq 200$, and x is the number of oxygen atoms required to satisfy valency requirement of other elements present.)