CLAIMS

[Claim 1]

A multi-hole extrusion die for production of catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, comprising:

a die body including die holes and a flow adjuster that allows a material to be molded to evenly flow into the die holes; and

a breaker plate comprising a material having a proof stress of 300 MPa or higher, the breaker plate being provided with a plurality of through-holes each having a size of a (mm), and the breaker plate having a thickness of b (mm), wherein

b/a is 0.5 or more and less than 3.0,

the multi-hole extrusion die has a structure in which a center section of the breaker plate is supported on a flat section provided to the flow adjuster of the die body,

the size of the die holes is 2 to 10 mm,

the aperture ratio of the breaker plate is 10 to 50%,

the size of the through-holes of the breaker plate, a, is 2 to 10 mm, and

the content of the material having a proof stress of 300 MPa or higher in the breaker plate is preferably 80% by mass or more.

[Claim 2]

A method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, comprising a step of extrusion-molding a kneaded product of a metal compound by using the multi-hole extrusion die according to claim 1 to produce metal compound extrusion-molded bodies, wherein

the metal compound is a catalyst for production of unsaturated aldehyde and/or unsaturated carboxylic acid.

[Claim 3]

The method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, according to claim 2, wherein the catalyst comprises molybdenum.

[Claim 4]

The method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, according claim 2 or 3, wherein the multi-hole extrusion die comprises a material that does not reduce the kneaded product.

[Claim 5]

The method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, according to any one of claims 2 to 4, wherein the breaker plate comprises at least one stainless steel material selected from the group consisting of martensitic stainless steel material, duplex stainless steel material, and precipitation-hardening stainless steel material.

[Claim 6]

The method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, according to any one of claims 2 to 5, wherein a member other than the breaker plate in the multi-hole extrusion die comprises at least one stainless steel material selected from the group consisting of austenitic stainless steel material, martensitic stainless steel material, ferritic stainless steel material, duplex stainless steel material, precipitation-hardening stainless steel material, and superalloy.

[Claim 7]

The method for producing catalyst extrusion-molded bodies for production of unsaturated aldehyde and/or unsaturated carboxylic acid, according to any one of claims 2 to 6, wherein extrusion pressure applied to the kneaded product in the extrusion-molding of the kneaded product by using the multi-hole extrusion die is 0.1 to 30 MPaG.

[Claim 8]

A method for producing catalyst extrusion-molded bodies for production of acrolein and acrylic acid, comprising a step of extrusion-molding a kneaded product of a catalyst for production of acrolein and acrylic acid by using the multi-hole extrusion die according to claim 1, wherein

the catalyst extrusion-molded bodies for production of acrolein and acrylic acid are for use in production of acrolein and acrylic acid through gas-phase catalytic oxidation of propylene with molecular oxygen, and at least comprise molybdenum and bismuth.

[Claim 9]

A method for producing catalyst extrusion-molded bodies for production of methacrolein and methacrylic acid, comprising a step of extrusion-molding a kneaded product of a catalyst for production of methacrolein and methacrylic acid by using the multi-hole extrusion die according to claim 1, wherein

the catalyst extrusion-molded bodies for production of methacrolein and methacrylic acid are for use in production of methacrolein and methacrylic acid through gas-phase catalytic oxidation of isobutylene and/or tertiary butyl alcohol with molecular oxygen, and at least comprise molybdenum and bismuth.

[Claim 10]

A method for producing catalyst extrusion-molded bodies for production of an unsaturated carboxylic acid, comprising a step of extrusion-molding a kneaded product of a catalyst for production of an unsaturated carboxylic acid by using the multi-hole extrusion die according to claim 1, wherein

the catalyst extrusion-molded bodies for production of an unsaturated carboxylic acid are for use in production of the unsaturated carboxylic acid through gas-phase catalytic oxidation of an unsaturated aldehyde with molecular oxygen, and comprise molybdenum and comprise phosphorous and/or vanadium.

[Claim 11]

The method for producing catalyst extrusion-molded bodies for production of an unsaturated carboxylic acid according to claim 10, wherein the unsaturated aldehyde is (meth)acrolein, and the unsaturated carboxylic acid is (meth)acrylic acid.

[Claim 12]

A method for producing acrolein and acrylic acid, comprising:

a step of producing catalyst extrusion-molded bodies for production of acrolein and acrylic acid by using the method according to claim 8; and

a step of filling a reactor with the extrusion-molded bodies and subjecting propylene to gas-phase catalytic oxidation with molecular oxygen by using the extrusion-molded bodies.

[Claim 13]

A method for producing methacrolein and methacrylic acid, comprising:

a step of producing catalyst extrusion-molded bodies for production of methacrolein and methacrylic acid by using the method according to claim 9; and

a step of filling a reactor with the extrusion-molded bodies and subjecting isobutylene and/or tertiary butyl alcohol to gas-phase catalytic oxidation with molecular oxygen by using the extrusion-molded bodies.

[Claim 14]

A method for producing an unsaturated carboxylic acid, comprising:

a step of producing catalyst extrusion-molded bodies for production of an unsaturated carboxylic acid by using the method according to claim 10 or 11; and

a step of filling a reactor with the extrusion-molded bodies and subjecting the unsaturated aldehyde to gas-phase catalytic oxidation with molecular oxygen by using the extrusion-molded bodies.