as a raw material while allowing the particle diameter to be varied as desired and also achieving a high recovery rate.

CITATION LIST

PATENT LITERATURE

[0015]

Patent Literature 1: US Patent No. 4960878

Patent Literature 2: JP-A-H06-329680

Patent Literature 3: JP-A-2000-509040

Patent Literature 4: JP-A-2005-263749

Patent Literature 5: JP-A-2000-505785

Patent Literature 6: JP-A-2002-179721

Patent Literature 7: JP-A-2003-327611

Patent Literature 8: JP-A-2008-069361

Patent Literature 9: JP-A-2009-001829

Patent Literature 10: JP-B-H07-42301

Patent Literature 11: JP-A-2000-95810

Patent Literature 12: JP-A-H08-319309

Patent Literature 13: JP-A-H07-70144

Patent Literature 14: JP-A-H07-300486

Patent Literature 15: WO 2010/055652

SUMMARY

[0015a]

In one aspect of the present disclosure, there is provided a solid polyaluminoxane composition comprising a

polyalkylaluminoxane and a trialkylaluminum,

the composition having a solubility in n-hexane at 25°C of less than 0.50 mol% as measured by a method (i) described below,

the composition having a solubility in toluene at 25°C of less than 1.0 mol% as measured by a method (ii) described below,

the molar fraction of alkyl groups derived from the trialkylaluminum moieties being 13 mol% or more relative to the total number of moles of alkyl groups derived from the polyalkylaluminoxane moieties and the alkyl groups derived from the trialkylaluminum moieties as measured with respect to tetrahydrofuran-d_8 soluble components by a method (iii) described below:

[Method (i)]

2 g of the solid polyaluminoxane composition is added to 50 mL of n-hexane held at 25°C; the mixture is stirred for 2 hours and is filtered to give a filtrate and a residue; and the aluminum concentration in the filtrate is measured by ICP atomic emission spectroscopy (ICP-AES) to determine the solubility as the ratio of aluminum atoms present in the filtrate relative to the amount of aluminum atoms corresponding to 2 g of the solid polyaluminoxane composition;

[Method (ii)]

the solubility is measured in a similar manner to the method (i) except that toluene is used in place of n-hexane;

[Method (iii)]

0.5 mL of tetrahydrofuran (THF)-d_8 (a heavy solvent) is added to 10 mg of the solid polyaluminoxane composition; the mixture is stirred at 25°C for 2 hours; and the molar fraction is determined by analyzing the THF-d_8 soluble components by ^{1}H-NMR at a measurement temperature of 24°C.

[0015b]

In another aspect of the present disclosure, there is provided an olefin polymerization catalyst obtained by bringing the solid polyaluminoxane composition as described herein into contact with a transition metal compound (H) having a transition metal atom selected from Groups 3 to 10 in the periodic table, the transition metal compound being represented by General Formula (8) below:

$$R^{31}R^{32}R^{33}R^{34}M \cdots (8)$$

(in the formula, M is a transition metal atom selected from Groups 3 to 10 in the periodic table, and R^{31}, R^{32}, R^{33} and R^{34} may be the same as or different from one another and each indicate a cyclopentadienyl skeleton-containing group, an alkyl, a cycloalkyl, an aryl, an aralkyl, an alkoxy, an aryloxy, a halogen atom, an alkylsilyl, an alkylamide, an alkylimide, $-SO_3R$ or a hydrogen atom).

[0015c]

In yet another aspect of the present disclosure, there is provided an olefin polymer production method comprising a step of polymerizing one or more olefins selected from α-olefins having 2 to 20 carbon atoms, cycloolefins having 3 to 20 carbon atoms and diene compounds having 4 to 20 carbon atoms in the presence of the olefin polymerization catalyst as described herein.

TECHNICAL PROBLEM

[0016]

An object of the present invention is to provide a solid

CLAIMS

[Claim 1]

A solid polyaluminoxane composition comprising a polyalkylaluminoxane and a trialkylaluminum,

the composition having a solubility in n-hexane at 25°C of less than 0.50 mol% as measured by a method (i) described below,

the composition having a solubility in toluene at 25°C of less than 1.0 mol% as measured by a method (ii) described below,

the molar fraction of alkyl groups derived from the trialkylaluminum moieties being 13 mol% or more relative to the total number of moles of alkyl groups derived from the polyalkylaluminoxane moieties and the alkyl groups derived from the trialkylaluminum moieties as measured with respect to tetrahydrofuran-d_8 soluble components by a method (iii) described below:

[Method (i)]

2 g of the solid polyaluminoxane composition is added to 50 mL of n-hexane held at 25°C; the mixture is stirred for 2 hours and is filtered to give a filtrate and a residue; and the aluminum concentration in the filtrate is measured by ICP

atomic emission spectroscopy (ICP-AES) to determine the solubility as the ratio of aluminum atoms present in the filtrate relative to the amount of aluminum atoms corresponding to 2 g of the solid polyaluminoxane composition;

[Method (ii)]

the solubility is measured in a similar manner to the method (i) except that toluene is used in place of n-hexane;

[Method (iii)]

0.5 mL of tetrahydrofuran (THF)-d_8 (a heavy solvent) is added to 10 mg of the solid polyaluminoxane composition; the mixture is stirred at 25°C for 2 hours; and the molar fraction is determined by analyzing the THF-d_8 soluble components by ^{1}H-NMR at a measurement temperature of 24°C.

[Claim 2]

The solid polyaluminoxane composition according to claim 1, wherein the composition has a solubility in tetrahydrofuran at 25°C of 95 mol% or less as measured by a method (iv) described below:

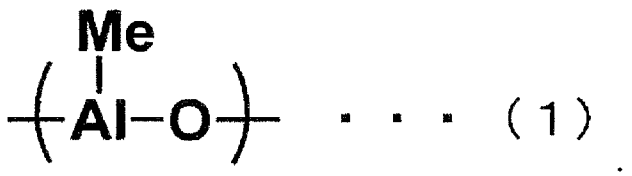
[Method (iv)]

the solubility is measured in a similar manner to the method (i) except that tetrahydrofuran is used in place of n-hexane.

[Claim 3]

The solid polyaluminoxane composition according to claim

1, wherein the polyalkylaluminoxane contains a structural unit represented by General Formula (1) below and the trialkylaluminums include trimethylaluminum



[Claim 4]

The solid polyaluminoxane composition according to claim 1, wherein the polyalkylaluminoxane is polymethylaluminoxane and the trialkylaluminum is trimethylaluminum, and

the molar fraction of methyl groups derived from the trimethylaluminum moieties is 13 mol% or more relative to the total number of moles of methyl groups derived from the polymethylaluminoxane moieties and the methyl groups derived from the trimethylaluminum moieties as measured with respect to tetrahydrofuran-d_8 soluble components by the method (iii).

[Claim 5]

The solid polyaluminoxane composition according to claim 1, wherein the composition has a specific surface area in the range of 400 to 800 m^2/g.

[Claim 6]

The solid polyaluminoxane composition according to

claim 1, wherein the composition is particles having a median diameter D50 in the cumulative volume in the range of 0.1 to 100 μm.

[Claim 7]

The solid polyaluminoxane composition according to claim 1, wherein the uniformity represented by the following equation is not more than 0.27,

(Equation) Uniformity = $\Sigma Xi|D50 - Di|/D50\Sigma Xi$

wherein Xi is the histogram value of a particle i, D50 is the volume-based median diameter, and Di is the volume-based diameter of the particle i.

[Claim 8]

An olefin polymerization catalyst obtained by bringing the solid polyaluminoxane composition described in any one of claims 1 to 7 into contact with a transition metal compound (H) having a transition metal atom selected from Groups 3 to 10 in the periodic table, the transition metal compound being represented by General Formula (8) below:

$R^{31}R^{32}R^{33}R^{34}M \cdots (8)$

(in the formula, M is a transition metal atom selected from Groups 3 to 10 in the periodic table, and R^{31}, R^{32}, R^{33} and R^{34} may be the same as or different from one another and each indicate a cyclopentadienyl skeleton-containing group, an alkyl, a cycloalkyl, an aryl, an aralkyl, an alkoxy, an aryloxy,

a halogen atom, an alkylsilyl, an alkylamide, an alkylimide, $-SO_3R$ or a hydrogen atom).

[Claim 9]

An olefin polymer production method comprising a step of polymerizing one or more olefins selected from α-olefins having 2 to 20 carbon atoms, cycloolefins having 3 to 20 carbon atoms and diene compounds having 4 to 20 carbon atoms in the presence of the olefin polymerization catalyst described in claim 8.