Claims

1. A method for producing a solid catalyst component for olefin polymerization, the method comprising:
bringing one or more magnesium compounds selected from the group consisting of a dialkoxymagnesium, a magnesium dihalide and an alkoxymagnesium halide, a tetravalent titanium halide compound, and one or more first internal electron donor compounds which are aromatic dicarboxylic diesters of formula (I) into contact with each other to effect a reaction, followed by washing, thereby obtaining a first product;
bringing a tetravalent titanium halide compound and one or more second internal electron donor compounds into contact with the first product to effect a reaction, followed by washing, thereby obtaining a second product; and
bringing one or more third internal electron donor compounds into contact with the second product in the absence of additional tetravalent titanium halide compound to effect a reaction,

$(R^1)_jC_6H_{4-j}(COOR^2)(COOR^3)$ (I)

wherein
$R^1$is independently an alkyl group comprising 1 to 8 carbon atoms or a halogen atom,
$R^2$and $R^3$are each independently an alkyl group comprising 1 to 12 carbon atoms,
and
j is a number of 0, 1, or 2.

2. The method according to claim 1, wherein a molar ratio of the second internal electron donor compound to the magnesium compound is 0.001 to 10.

3. The method according to claim 1, wherein a molar ratio of the third internal electron donor compound to the magnesium compound is 0.001 to 10.

4. The method according to claim 1, wherein molar quantity of the first internal electron donor compound is larger than a molar quantity of the second internal electron donor compound, which is larger than or equal to a molar quantity of the third internal electron donor compound.

5. The method according to claim 1, wherein the third internal electron donor compound is brought into contact with the second product in an inert organic solvent in which the concentration of unreacted tetravalent titanium halide compound is controlled to 0 to 5

mass %.

6. An olefin polymerization catalyst obtained by a process comprising:
bringing a solid catalyst component for olefin polymerization obtained by the method according to claim 1, an organoaluminum compound of formula (II), and an external electron donor compound into contact with each other,

$R^4_pAlQ_{3-p}$ (II)

wherein
R^4 is an alkyl group comprising 1 to 6 carbon atoms,
Q is a hydrogen atom or a halogen atom, and
p is a real number that satisfies $0<p\leqq 3$.

7. The olefin polymerization catalyst according to claim 6, wherein the external electron donor compound is one or more organosilicon compounds selected from the group consisting of an organosilicon compound of formula (III) and an organosilicon compound of formula (IV),

$R^5_qSi(OR^6)_{4-q}$ (III)

wherein
R^5 is independently an alkyl group comprising 1 to 12 carbon atoms, a cycloalkyl group comprising 3 to 12 carbon atoms, a phenyl group, a vinyl group, an allyl group, or an aralkyl group,
R^6 is independently an alkyl group comprising 1 to 4 carbon atoms, a cycloalkyl group comprising 3 to 6 carbon atoms, a phenyl group, a vinyl group, an allyl group, or an aralkyl group, and
q is an integer of from 0 to 3,

$(R^7R^8N)_sSiR^9_{4-s}$ (IV)

wherein
R^7 and R^8 are independently a hydrogen atom, a linear alkyl group having 1 to 20 carbon atoms, a branched alkyl group comprising 3 to 20 carbon atoms, a vinyl group, an allyl group, an aralkyl group, a cycloalkyl group comprising 3 to 20 carbon atoms, or an aryl group, provided that R^7 and R^8 optionally bond to each other to form a ring,
R^9 is independently a linear alkyl group having comprising 1 to 20 carbon atoms, a branched alkyl group comprising 3 to 20 carbon atoms, a vinyl group, an allyl group, an aralkyl group, a linear or branched alkoxy group comprising 1 to 20 carbon atoms, a vinyloxy group, an allyloxy group, a cycloalkyl group comprising 3 to 20 carbon atoms, an aryl group, or an aryloxy group, and

s is an integer of from 1 to 3.

8. A method for producing an olefin polymer, the method comprising
polymerizing an olefin in the presence of the olefin polymerization catalyst according to claim 6.

9. The method according to claim 1, wherein the one or more magnesium compounds comprises a dialkoxymagnesium.

10. The method according to claim 1, wherein the one or more magnesium compounds comprises a magnesium dihalide.

11. The method according to claim 1, wherein the one or more magnesium compounds comprises an alkoxymagnesium halide.

12. The method according to claim 1, wherein the tetravalent titanium halide compound is represented by formula (V):
$Ti(OR^{10})_rX_{4-r}$ (V)
wherein
$R^{10}$is an alkyl group having 1 to 4 carbon atoms,
X is a halogen atom, and
r is an integer from 0 to 3.

13. The method according to claim 1, wherein the tetravalent titanium halide compound is at least one member selected from the group consisting of titanium tetrachloride, titanium tetrabromide, titanium tetraiodide, methoxytitanium trichloride, ethoxytitanium trichloride, propoxytitanium trichloride, n-butoxytitanium trichloride, dimethoxytitanium dichloride, diethoxytitanium dichloride, dipropoxytitanium dichloride, di-n-butoxytitanium dichloride, trimethoxytitanium chloride, triethoxytitanium chloride, tripropoxytitanium chloride and tri-n-butoxytitanium chloride.

14. The method according to claim 1, wherein the tetravalent titanium halide compound is titanium tetrachloride.

15. The method according to claim 1, wherein the one or more second internal electron

donor compounds are organic compounds that include two or more electron donor sites and do not include silicon.

16. The method according to claim 1, wherein the one or more third internal electron donor compounds are organic compounds that include two or more electron donor sites and do not include silicon.

17. The method according to claim 1, wherein the one or more magnesium compounds comprises a dialkoxymagnesium and wherein the dialkoxymagnesium is dimethoxymagnesium, diethoxymagnesium, dipropoxymagnesium, dibutoxymagnesium, ethoxymethoxymagnesium, ethoxypropoxymagnesium or butoxyethoxymagnesium.

18. The method according to claim 1, wherein the one or more magnesium compounds comprises a magnesium dihalide and wherein the magnesium dihalide is magnesium dichloride, magnesium dibromide or magnesium diiodide.