CLAIMS

1. A solid catalyst component for olefin polymerization comprising magnesium, titanium, a halogen, a compound represented by a general formula (1), and a compound represented by a general formula (2),

$(R^1)_kC_6H_{4-k}(COOR^2)(COOR^3)$ (1)

wherein R^1 is an alkyl group having 1 to 8 carbon atoms or a halogen atom, R^2 and R^3 are an alkyl group having 1 to 12 carbon atoms, provided that R^2 and R^3 are either identical or different, and k, which is the number of substituents R^1, is 0, 1, or 2, provided that R^1 are either identical or different when k is 2,

$R^4O\text{-}C(=O)\text{-}O\text{-}Z\text{-}OR^5$ (2)

wherein R^4 and R^5 are a linear alkyl group having 1 to 20 carbon atoms, a branched alkyl group having 3 to 20 carbon atoms, a vinyl group, a linear or branched alkenyl group having 3 to 20 carbon atoms, a linear halogen-substituted alkyl group having 1 to 20 carbon atoms, a branched halogen-substituted alkyl group having 3 to 20 carbon atoms, a linear halogen-substituted alkenyl group having 2 to 20 carbon atoms, a branched halogen-substituted alkenyl group having 3 to 20 carbon atoms, a cycloalkyl group having 3 to 20 carbon atoms, a cycloalkenyl group having 3 to 20 carbon atoms, a halogen-substituted cycloalkyl group having 3 to 20 carbon atoms, a halogen-substituted cycloalkenyl group having 3 to 20 carbon atoms, an aromatic hydrocarbon group having 6 to 24 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 24 carbon atoms, a nitrogen atom-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, an oxygen atom-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, or a phosphorus-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, provided that R^4 and R^5 are either identical or different, the nitrogen atom-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a C=N group, the oxygen

atom-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a carbonyl group, and the phosphorus-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a C=P group, and Z is a linking group that includes a carbon atom or a carbon chain.

2. An olefin polymerization catalyst comprising the solid catalyst component for olefin polymerization according to claim 1, and an organoaluminum compound represented by a general formula (3),

$$R^6AlQ_{3-r} \qquad (3)$$

wherein R^6 is a hydrocarbyl group having 1 to 6 carbon atoms, provided that a plurality of R^6 are either identical or different when a plurality of R^6 are present, Q is a hydrogen atom, a hydrocarbyloxy group having 1 to 6 carbon atoms, or a halogen atom, and p is a real number that satisfies $0<p\leq3$.

3. The olefin polymerization catalyst according to claim 2, further comprising an external electron donor compound (III).

4. The olefin polymerization catalyst according to claim 3, wherein the external electron donor compound (III) is one compound, or two or more compounds, selected from an organosilicon compound represented by a general formula (4) and an aminosilane compound represented by a general formula (5),

$$R^7_qSi(OR^8)_{4-q} \qquad (4)$$

wherein R^7 is an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 12 carbon atoms, a cycloalkenyl group having 3 to 12 carbon atoms, an aromatic hydrocarbon group having 6 to 15 carbon atoms, or a substituted aromatic hydrocarbon group, provided that a plurality of R^7 are either identical or different when a plurality of R^7 are present, R^8 is

an alkyl group having 1 to 4 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 6 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, or a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, provided that a plurality of R^8 are either identical or different when a plurality of R^8 are present, and q is an integer from 0 to 3,

$$(R^9R^{10}N)_sSiR^{11}_{4-s} \qquad (5)$$

wherein R^9 and R^{10} are a hydrogen atom, an alkyl group having 1 to 20 carbon atoms, a vinyl group, an alkenyl group having 3 to 20 carbon atoms, a cycloalkyl group having 3 to 20 carbon atoms, a cycloalkenyl group having 3 to 20 carbon atoms, or an aryl group having 6 to 20 carbon atoms, provided that R^9 and R^{10} are either identical or different, and optionally bond to each other to form a ring, R^{11} is an alkyl group having 1 to 20 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, a vinyloxy group, an alkenyloxy group having 3 to 20 carbon atoms, a cycloalkyl group having 3 to 20 carbon atoms, a cycloalkyloxy group having 3 to 20 carbon atoms, an aryl group having 6 to 20 carbon atoms, or an aryloxy group having 6 to 20 carbon atoms, provided that a plurality of R^{11} are either identical or different when a plurality of R^{11} are present, and s is an integer from 1 to 3.

5. The olefin polymerization catalyst according to claim 3, wherein the external electron donor compound (III) is phenyltrimethoxysilane, n-butyltrimethoxysilane, cyclopentyltrimethoxysilane, cyclohexyltrimethoxysilane, phenyltriethoxysilane, n-butyltriethoxysilane, cyclopentyltriethoxysilane, cyclohexyltriethoxysilane, t-butylmethyldimethoxysilane, t-butylethyldimethoxysilane, diisopropyldimethoxysilane, diisobutyldimethoxysilane, diisopentyldimethoxysilane, diphenyldimethoxysilane, dicyclopentyldimethoxysilane, cyclohexylmethyldimethoxysilane, cyclohexylcyclopentyldimethoxysilane,

tetramethoxysilane, tetraethoxysilane, t-butylmethylbis(ethylamino)silane, dicyclohexylbis(ethylamino)silane, dicyclopentylbis(ethylamino)silane, bis(perhydroisoquinolino)dimethoxysilane, diethylaminotrimethoxysilane, or diethylaminotriethoxysilane.

6. The olefin polymerization catalyst according to claim 3, wherein the external electron donor compound (III) is a 1,3-diether compound represented by a general formula (6),

$$R^{12}OCH_2CR^{13}R^{14}CH_2OR^{15} \qquad (6)$$

wherein R^{13} and R^{14} are a hydrogen atom, a halogen atom, an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 12 carbon atoms, a cycloalkenyl group having 3 to 12 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 12 carbon atoms, a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, an alkylamino group having 1 to 12 carbon atoms, or a dialkylamino group having 2 to 12 carbon atoms, provided that R^{13} and R^{14} are either identical or different, and optionally bond to each other to form a ring, and R^{12} and R^{15} are an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 6 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 12 carbon atoms, or a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, provided that R^{12} and R^{15} are either identical or different.

7. The olefin polymerization catalyst according to claim 6, wherein the 1,3-diether compound is 2-isopropyl-2-isobutyl-1,3-dimethoxypropane, 2-isopropyl-2-isopentyl-1,3-dimethoxypropane, or 9,9-bis(methoxymethyl)fluorene.

8. A method for producing an olefin polymer comprising polymerizing an olefin in the presence of the olefin polymerization catalyst according to any one of claims 2 to 7.

The invention claimed is:

1. A solid catalyst component, comprising:
magnesium,
titanium,
a halogen,
a compound represented by formula (1):
$(R^1)_kC_6H_{4-k}(COOR^2)(COOR^3)$ (1)
a compound represented by formula (2):
$R^4O\text{-}C(=O)\text{-}O\text{-}Z\text{-}OR^5$ (2)
wherein R^1 is an alkyl group having 1 to 8 carbon atoms or a halogen atom, R^2 and R^3 are an alkyl group having 1 to 12 carbon atoms, wherein R^2 and R^3 are either identical or different, and k, which is the number of substituents R^1, is 0, 1, or 2, wherein each R^1 is either identical or different when k is 2, and
wherein R^4 and R^5 are a linear alkyl group having 1 to 20 carbon atoms, a branched alkyl group having 3 to 20 carbon atoms, a vinyl group, a linear or branched alkenyl group having 3 to 20 carbon atoms, a linear halogen-substituted alkyl group having 1 to 20 carbon atoms, a branched halogen-substituted alkyl group having 3 to 20 carbon atoms, a linear halogen-substituted alkenyl group having 2 to 20 carbon atoms, a branched halogen-substituted alkenyl group having 3 to 20 carbon atoms, a cycloalkyl group having 3 to 20 carbon atoms, a cycloalkenyl group having 3 to 20 carbon atoms, a halogen-substituted cycloalkyl group having 3 to 20 carbon atoms, a halogen-substituted cycloalkenyl group having 3 to 20 carbon atoms, an aromatic hydrocarbon group having 6 to 24 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 24 carbon atoms, a nitrogen atom-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, an oxygen atom-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, or a phosphorus-containing hydrocarbon group having 2 to 24 carbon atoms that is terminated by a carbon atom, provided that R^4 and R^5 are either identical or different, the nitrogen atom-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a C=N group, the oxygen atom-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a carbonyl group, and the phosphorus-containing hydrocarbon group having 2 to 24 carbon atoms excludes a group that is terminated by a C=P group, and Z is a linking group that includes a carbon

atom or a carbon chain.

2. An olefin polymerization catalyst comprising:
the solid catalyst component of claim 1, and an organoaluminum compound represented by formula (3),
$R^6_pAlQ_{3-r}$ (3)
wherein R^6 is an alkyl group having 1 to 6 carbon atoms, Q is a hydrogen atom, or a halogen atoms, and p is a real number that satisfies $0<p\leq3$.

3. The olefin polymerization catalyst of claim 2, further comprising:
an external electron donor compound (III).

4. The olefin polymerization catalyst of claim 3, wherein the external electron donor compound (III) is at least one compound selected from the group consisting of an organosilicon compound represented by formula (4):
$R^7_qSi(OR^8)_{4-q}$ (4)
an aminosilane compound represented by formula (5):
$(R^9R^{10}N)_sSiR^{11}_{4-s}$ (5)
wherein R^7 is an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 12 carbon atoms, a cycloalkenyl group having 3 to 12 carbon atoms, an aromatic hydrocarbon group having 6 to 15 carbon atoms, or a substituted aromatic hydrocarbon group, wherein each R^7 is either identical or different when a plurality of R^7 are present, R^8 is an alkyl group having 1 to 4 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 6 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, or a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, wherein each R^8 is either identical or different when a plurality of R^8 are present, and q is an integer from 0 to 3, and wherein R^9 and R^{10} are a hydrogen atom, an alkyl group having 1 to 20 carbon atoms, a vinyl group, an alkenyl group having 3 to 20 carbon atoms, a cycloalkyl group having 3 to 20 carbon atoms, a cycloalkenyl group having 3 to 20 carbon atoms, or an aryl group having 6 to 20 carbon atoms, wherein R^9 and R^{10} are either identical or different, and optionally bond to each other to form a ring, R^{11} is an alkyl group having 1 to 20 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, an alkoxy group having 1 to 20 carbon atoms, a vinyloxy group, an alkenyloxy group having 3 to 20 carbon atoms, a cycloalkyl group

having 3 to 20 carbon atoms, a cycloalkyloxy group having 3 to 20 carbon atoms, an aryl group having 6 to 20 carbon atoms, or an aryloxy group having 6 to 20 carbon atoms, wherein each R^{11} is either identical or different when a plurality of R^{11} are present, and s is an integer from 1 to 3.

5. The olefin polymerization catalyst of claim 3, wherein the external electron donor compound (III) is phenyltrimethoxysilane, n-butyltrimethoxysilane, cyclopentyltrimethoxysilane, cyclohexyltrimethoxysilane, phenyltriethoxysilane, n-butyltriethoxysilane, cyclopentyltriethoxysilane, cyclohexyltriethoxysilane, t-butylmethyldimethoxysilane, t-butylethyldimethoxysilane, diisopropyldimethoxysilane, diisobutyldimethoxysilane, diisopentyldimethoxysilane, diphenyldimethoxysilane, dicyclopentyldimethoxysilane, cyclohexylmethyldimethoxysilane, cyclohexylcyclopentyldimethoxysilane, tetramethoxysilane, tetraethoxysilane, t-butylmethylbis(ethylamino)silane, dicyclohexylbis(ethylamino)silane, dicyclopentylbis(ethylamino)silane, bis(perhydroisoquinolino)dimethoxysilane, diethylaminotrimethoxysilane, or diethylaminotriethoxysilane.

6. The olefin polymerization catalyst of claim 3, wherein the external electron donor compound (III) is a 1,3-diether compound represented by formula (6):
$R^{12}OCH_2CR^{13}R^{14}CH_2OR^{15}$ (6)
wherein R^{13} and R^{14} are a hydrogen atom, a halogen atom, an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 12 carbon atoms, a cycloalkenyl group having 3 to 12 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 12 carbon atoms, a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, an alkylamino group having 1 to 12 carbon atoms, or a dialkylamino group having 2 to 12 carbon atoms, wherein R^{13} and R^{14} are either identical or different, and optionally bond to each other to form a ring, and R^{12} and R^{15} are an alkyl group having 1 to 12 carbon atoms, a vinyl group, an alkenyl group having 3 to 12 carbon atoms, a cycloalkyl group having 3 to 6 carbon atoms, an aromatic hydrocarbon group having 6 to 12 carbon atoms, a halogen-substituted aromatic hydrocarbon group having 6 to 12 carbon atoms, or a substituted aromatic hydrocarbon group having 7 to 12 carbon atoms, wherein R^{12} and

R^{15} are either identical or different.

7. The olefin polymerization catalyst of claim 6, wherein the 1,3-diether compound is 2-isopropyl-2-isobutyl-1,3-dimethoxypropane, 2-isopropyl-2-isopentyl-1,3-dimethoxypropane, or 9,9-bis(methoxymethyl)fluorene.

8. A method for producing an olefin polymer comprising:
polymerizing an olefin in the presence of the olefin polymerization catalyst of claim 2.