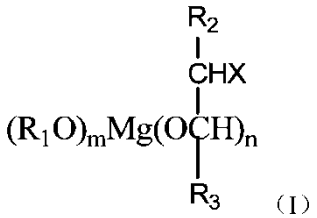
Claims

1. A carrier for an olefin polymerization catalyst, comprising a magnesium-containing compound and sulfur, wherein the sulfur is an elemental sulfur, wherein a molar ratio of magnesium in the magnesium-containing compound to the sulfur is 1:q, wherein $0.0001<q\leq 0.3$; wherein the magnesium-containing compound is selected from magnesium compounds represented by Formula (I),



(I)

wherein in Formula (I), R_1 is selected from the group consisting of substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl;

R_2 and R_3 are identical to or different from each other, each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl;

X is halogen; and

m is 0.1-1.9; n is 0.1-1.9; and m+n=2.

2. The carrier according to claim 1, wherein $0.001<q\leq 0.1$.

3. The carrier according to claim 1 or 2, wherein in Formula (I), R_1 is selected from the group consisting of substituted or unsubstituted C_1-C_8 linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{15} aryl, substituted or unsubstituted C_7-C_{15} aralkyl, and substituted or unsubstituted C_7-C_{15} alkaryl; preferably, R_1 is selected from the group consisting of substituted or unsubstituted C_1-C_6 linear alkyl,

substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl;

R_2 and R_3 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl; preferably, R_2 and R_3 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_6 linear alkyl, substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_8 aryl, substituted or unsubstituted C_7-C_9 aralkyl, and substituted or unsubstituted C_7-C_9 alkylaryl;

X is chlorine or bromine.

4. The carrier according to any one of claims 1 to 3, wherein the carrier is spherical or quasi-spherical, and has an average particle diameter of less than or equal to 30 microns, preferably less than or equal to 20 microns.

5. The carrier according to any one of claims 1 to 4, wherein the carrier is spherical or quasi-spherical, and has a particle size distribution of less than 1.2, preferably less than or equal to 0.8.

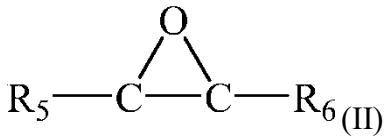
6. The carrier according to any one of claims 1 to 5, wherein raw materials for synthesizing the carrier comprise an elemental sulfur, a magnesium halide represented by a general formula MgX_1Y, a compound represented by a general formula R_4OH, and an ethylene oxide compound;

in the general formula MgX_1Y, X1 is halogen, preferably chlorine or bromine; Y is selected from the group consisting of halogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_1-C_{10} alkoxy, substituted or unsubstituted C_6-C_{20} aryloxy, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl;

in the general formula R_4OH, R_4 is selected from the group consisting of

substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl; preferably, R_4 is selected from the group consisting of substituted or unsubstituted C_1-C_8 linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{15} aryl, substituted or unsubstituted C_7-C_{15} aralkyl, and substituted or unsubstituted C_7-C_{15} alkaryl; more preferably, R_4 is selected from the group consisting of substituted or unsubstituted C_1-C_6 linear alkyl, substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl;

the ethylene oxide compound has a structure shown in Formula (II):



(II)

in Formula (II), R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl; preferably, R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_8 linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl; more preferably, R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_6 linear alkyl, substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_8 aryl, substituted or unsubstituted C_7-C_9 aralkyl, and substituted or unsubstituted C_7-C_9 alkaryl.

7. A method for preparing a carrier for an olefin polymerization catalyst, comprising the following steps:

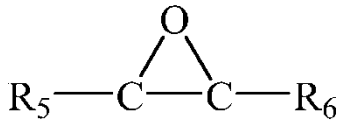
(1) preparing a mixture, wherein the mixture comprises an elemental sulfur, a

magnesium halide represented by a general formula MgX_1Y, and a compound represented by a general formula R_4OH; wherein based on 1 mol of the magnesium halide represented by the general formula MgX_1Y, the elemental sulfur is present in an amount of 0.0001-0.5 mol; and

(2) contacting and reacting the mixture obtained in step (1) with an ethylene oxide compound; wherein in the general formula MgX_1Y, X1 is halogen, preferably chlorine or bromine; Y is selected from the group consisting of halogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_1-C_{10} alkoxy, substituted or unsubstituted C_6-C_{20} aryloxy, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl;

in the general formula R_4OH, R_4 is selected from the group consisting of substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl, and substituted or unsubstituted C_7-C_{20} alkaryl; preferably, R_4 is selected from the group consisting of substituted or unsubstituted C_1-C_8 linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{15} aryl, substituted or unsubstituted C_7-C_{15} aralkyl, and substituted or unsubstituted C_7-C_{15} alkaryl; more preferably, R_4 is selected from the group consisting of substituted or unsubstituted C_1-C_6 linear alkyl, substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl;

the ethylene oxide compound has a structure shown in Formula (II):



(II)

in Formula (II), R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_{10} linear alkyl, substituted or unsubstituted C_3-C_{10} branched alkyl, substituted or unsubstituted C_3-C_{10} cycloalkyl, substituted or unsubstituted C_6-C_{20} aryl, substituted or unsubstituted C_7-C_{20} aralkyl,

and substituted or unsubstituted C_7-C_{20} alkaryl; preferably, R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_8 linear alkyl, substituted or unsubstituted C_3-C_8 branched alkyl, substituted or unsubstituted C_3-C_8 cycloalkyl, substituted or unsubstituted C_6-C_{10} aryl, substituted or unsubstituted C_7-C_{10} aralkyl, and substituted or unsubstituted C_7-C_{10} alkaryl; more preferably, R_5 and R_6 are each independently selected from the group consisting of hydrogen, substituted or unsubstituted C_1-C_6 linear alkyl, substituted or unsubstituted C_3-C_6 branched alkyl, substituted or unsubstituted C_3-C_6 cycloalkyl, substituted or unsubstituted C_6-C_8 aryl, substituted or unsubstituted C_7-C_9 aralkyl, and substituted or unsubstituted C_7-C_9 alkaryl.

8. The method according to claim 7, wherein based on 1 mol of the magnesium halide represented by the general formula MgX_1Y, the compound represented by the general formula R_4OH is present in an amount of 4-30 mol; and the ethylene oxide compound is present in an amount of 1-10 mol;

preferably, based on 1 mol of the magnesium halide represented by the general formula MgX_1Y, the compound represented by the general formula R_4OH is present in an amount of 6-20 mol, and the ethylene oxide compound is present in an amount of 2-6 mol.

9. The method according to claim 7 or 8, wherein in step (1), the mixture further comprises an inert liquid medium and a surfactant, and is obtained by mixing the elemental sulfur, the magnesium halide represented by the general formula MgX_1Y, the compound represented by the general formula R_4OH, the inert liquid medium, and the surfactant together at one time or step by step and then heating a resulting mixture; preferably, the heating is conducted at a temperature of 80-120°C for a time period of 0.5-5 hours; more preferably, the heating is conducted at a temperature of 80-100°C for a time period of 0.5-3 hours.

10. The method according to any one of claims 7 to 9, wherein in step (2), the contacting and reacting is conducted at conditions of a temperature of 40-120°C for a time period of 15-60 minutes, preferably of a temperature of 60-100°C for a time period of 20-50 minutes.

11. The method according to claim 9, wherein the inert liquid medium is a silicone oil solvent and/or a hydrocarbon solvent; preferably, the inert liquid medium is at least one selected from the group consisting of kerosene, paraffin oil, petrolatum oil, white oil, methyl silicone oil, ethyl silicone oil, methyl ethyl silicone oil, phenyl silicone oil, and methyl phenyl silicone; and/or

based on 1 mol of the magnesium halide represented by the general formula MgX_1Y, the inert liquid medium is present in an amount of 0.8-10 L.

12. The preparation method according to claim 9, wherein the surfactant is at least one selected from the group consisting of polyvinylpyrrolidone, polyethylene glycol, polyvinyl alcohol, polyacrylic acid, polyacrylate, polyacrylamide, polystyrene sulfonate, naphthalenesulfonic acid formaldehyde condensate, condensed alkyl phenyl ether sulfate, condensed alkyl phenol polyoxyethylene ether phosphate, oxyalkyl acrylate copolymer modified polyethyleneimine, 1-dodeca-4-vinylpyridine bromide polymer, polyvinylbenzyltrimethylamine salt, polyethylene oxide propylene oxide block copolymer, polyvinylpyrrolidone vinyl acetate copolymer, alkyl phenyl polyoxyethylene ether, and polyalkyl methacrylate; and/or

based on 1 mol of the magnesium halide represented by the general formula MgX_1Y, the surfactant is present in an amount of 1-20 g.

13. The method according to any one of claims 7 to 12, wherein the elemental sulfur is at least one selected from α-sulfur, β-sulfur, γ-sulfur, and polymeric sulfur.

14. The method according to any one of claims 7 to 13, wherein in the general formula MgX_1Y, X1 is chlorine or bromine, and Y is chlorine, bromine, C_1-C5 alkoxy or C_6-C_{10} aryloxy; preferably, the magnesium halide represented by the general formula MgX_1Y is at least one selected from magnesium chloride, magnesium bromide, phenoxymagnesium chloride, isopropoxymagnesium chloride, and n-butoxymagnesium chloride; and/or

in the general formula R_4OH, R_4 is C_1-C_8 alkyl; preferably, the compound represented by the general formula R_4OH is at least one selected from the group consisting of ethanol, n-propanol, isopropanol, n-butanol, isobutanol, n-pentanol, isopentanol, n-hexanol, 2-ethylhexanol, and n-octanol; and/or

in the ethylene oxide compound having the structure shown in Formula (II), R_5

and R_6 are each independently hydrogen, C_1-C_3 alkyl, or C_1-C_3 halogenated alkyl; preferably, the ethylene oxide compound is at least one selected from the group consisting of ethylene oxide, epoxypropane, epoxybutane, epoxychloropropane, epoxychlorobutane, epoxybromopropane, and epoxybromobutane.

15. A catalyst component for olefin polymerization, comprising the carrier according to any one of claims 1 to 6, titanium, and an optional electron donor.

16. A catalyst component for olefin polymerization, comprising a reaction product resulted from a reaction of the carrier according to any one of claims 1 to 6 with a titanium compound and an optional electron donor.

17. The catalyst component according to claim 15 or 16, wherein the catalyst component is spherical or quasi-spherical, and has an average particle diameter of less than or equal to 30 microns, preferably less than or equal to 20 microns.

18. The catalyst component according to any one of claims 15 to 17, wherein the catalyst component is spherical or quasi-spherical, and has a particle size distribution of less than 1.2, preferably less than or equal to 0.8.

19. Use of the carrier according to any one of claims 1 to 6 and/or the catalyst component according to any one of claims 15 to 18 in preparation of a catalyst for olefin polymerization.

20. A catalyst for olefin polymerization, comprising:

(1) the catalyst component according to any one of claims 15 to 18;

(2) an alkyl aluminum compound; and

(3) an optional external electron donor compound.

21. An olefin polymerization method, comprising: contacting one or more olefins with the catalyst according to claim 20 under olefin polymerization conditions, wherein, preferably, the olefin is an olefin represented by CH_2=CHR, R being selected from hydrogen and C_1-C_6 linear or branched alkyl.