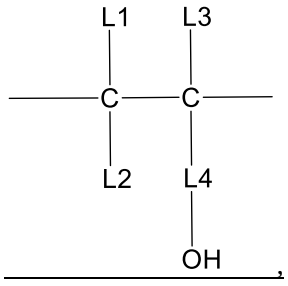
Claims

1. An olefin-olefinic alcohol copolymer, comprising a plurality of polymeric particles, wherein one or more of the plurality of polymeric particle is spherical in shape and has~~spherical and/or spherical-like polymer, at least part of spherical and/or spherical-like polymers having~~ a cavity therein,

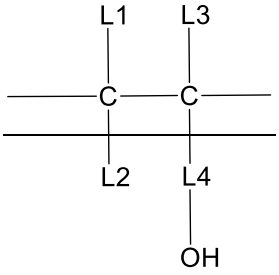
wherein the copolymer comprises a structural unit derived from olefin and a structural unit of Formula I:



Formula I

wherein, in Formula I, L1-L3 each is independently selected from the group consisting of H and C_1-C_{30} alkyl, and L4 is C_1-C_{30} alkylene having a side group; the C_1-C_{30} alkyl being optionally substituted by a substituent.

~~2. The copolymer according to claim 1, wherein the copolymer comprises a structural unit derived from olefin and a structural unit derived from olefinic alcohol shown in Formula I,~~



~~Formula I~~

~~wherein in Formula I, L1-L3 each are independently selected from the group consisting of H and C_1-C_{30} alkyl, and L4 is C_1-C_{30} alkylene having a side group; the C_1-C_{30} alkyl is optionally substituted by a substituent, and preferably the substituent is one or more selected from the group consisting of halogen, C_1-C_{10} alkyl, C_1-C_{10} alkoxy, C_6-C_{10} aryl, cyano group and hydroxyl; preferably, the side group is one or more selected from the group consisting of halogen, C_6-C_{20} aryl, C_1-C_{20} alkyl and~~

~~C_1-C_{20} alkoxy; and~~

~~preferably, L1 and L2 are H, L3 is selected from the group consisting of H, C_1-C_{10} alkyl and C_1-C_{10} alkyl substituted by halogen, L4 is C_1-C_{10} alkylene having a side group which is preferably one or more selected from the group consisting of halogen, C_6-C_{10} aryl, and C_1-C_{10} alkyl.~~

~~3~~2. The copolymer according to claim 1~~ or claim 2~~, wherein a density of the ~~spherical and/or spherical-like~~ polymer particles is 0.3000-0.7500g/cm^3, ~~preferably 0.4000-0.6500g/cm^3, and the density is~~ measured according to~~by using~~ GB/T6~~46~~34~~3~~-2009.

~~4~~3. The copolymer according to ~~any of~~ claim~~s~~ 1~~-3~~, wherein an average particle size of the plurality of polymeric particles~~spherical and/or spherical-like polymer~~ is 0.1-50.0mm; and/or a volume of the cavity in each polymeric particle~~the spherical and/or spherical-like polymer having a cavity therein~~ is 5-99%~~, preferably 30-95%, more preferably 50-90%,~~ of a volume of the ~~spherical and/or spherical-like~~ polymer particle~~.~~.

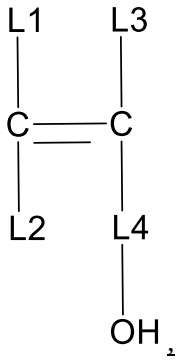
~~5~~4. The copolymer according to ~~any of~~ claim~~s~~ 1~~-4~~, wherein each polymeric particle comprises a plurality of microsphere particles~~ are distributed in the spherical and/or spherical-like polymer~~; and based on ~~the~~a total weight of the copolymer, a content of the plurality of ~~microsphere~~ particles is 5-70wt%~~, preferably 10-50wt%~~.

~~6~~5. The copolymer according to claim ~~5~~4, wherein an average particle size of the microsphere particles is 0.1-5.0μm~~, preferably 0.3-3.0μm~~.

~~7~~6. The copolymer according to ~~any of~~ claim~~s~~ 1~~-6~~, wherein, in the copolymer, a content of the structural unit derived from the olefinic alcohol ~~shown in~~of Formula I is 0.4-30.0mol%~~, preferably 0.7-10.0mol%~~.

~~8~~7. The copolymer according to ~~any of~~ claim~~s~~ ~~2-7~~1, wherein the structural unit derived from olefin is selected from the group consisting of a structural unit derived from C_2-C_{16} α-olefin and a structural unit derived from C_3-C_{16} cycloolefin~~, and preferably the α-olefin or the cycloolefin is monoolefine~~.

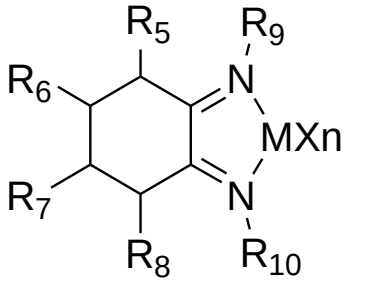
~~9~~8. A preparation method for the olefin-olefinic alcohol copolymer according to ~~any of~~ claim~~s~~ 1~~-8~~, comprising contacting an olefin and an olefinic alcohol ~~shown in~~of Formula II with a catalyst and optionally a chain transfer agent for reaction in the presence of an alkane solvent in a reaction system to obtain the copolymer;



Formula II

wherein in Formula II, definitions of L1-L4 are the same as the definitions of L1-L4 in Formula I; and

the catalyst comprises~~includes~~ a first~~main~~ catalyst and a co-catalyst, wherein the first~~main~~ catalyst is ~~selected from at least~~ one or more metal complex ~~shown in~~of Formula III:



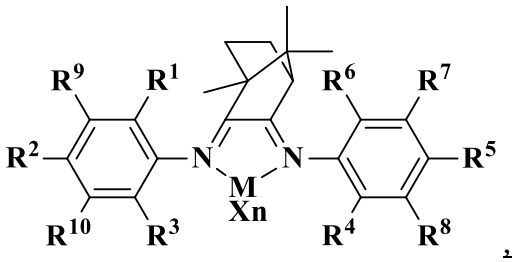
Formula III

wherein, in Formula III, R_9 and R_{10} each ~~are~~is independently selected from the group consisting of substituted or unsubstituted hydrocarbyl; R_5-R_8 are identical to or different from each other, each ~~are~~is independently selected from the group consisting of H, halogen, and substituted or unsubstituted hydrocarbyl, and optionally form a ring with each other; M is a Group VIII metal; X is one or more selected from the group consisting of halogen, hydrocarbyl and hydrocarbyloxy; and n is an integer that meets an M valence state.

~~10~~9. The preparation method according to claim ~~9~~8, wherein, in Formula III, R_9

and R_{10} each ~~are~~is independently selected from the group consisting of substituted or unsubstituted C_6-C_{30} aryl and substituted or unsubstituted C_7-C_{30} aralkyl; R_5-R_8 are identical to or different from each other, each ~~are~~is independently selected from the group consisting of H and C_1-C_{20} hydrocarbyl, and optionally form a ring with each other; M is a Group VIII metal; X is one or more selected from the group consisting of halogen and C_1-C_{10} hydrocarbyl; and n is an integer that meets an M valence state.

~~11~~10. The preparation method according to claim ~~9~~8 ~~or claim 10~~, wherein the ~~main~~ catalyst is selected from at least one metal complex shown in Formula IV:



Formula IV

wherein, in Formula IV, R^1-R^{10} are identical to or different from each other, and each ~~are~~is independently selected from the group consisting of H, halogen, C_1-C_{24} hydrocarbyl, and C_1-C_{24} hydrocarbyloxy, R^1-R^3, R^9, and R^{10} optionally forming a ring ~~to each other~~, R^4-R^6, R^7, and R^8 optionally forming a ring ~~to each other~~; and M, X, and n have the same definitions as those in Formula III.

~~12~~11. The preparation method according to claim ~~11~~10, wherein, in Formula IV, R^7-R^{10} are H, and R^1-R^6 are identical to or different from each other and each ~~are~~is independently selected from the group consisting of H and C_1-C_6 alkyl.

~~13~~12. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-12~~, wherein the M is nickel.

~~14~~13. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-13~~, wherein the co-catalyst is selected from the group consisting of an organic aluminum compound and an organic boron compound;

the organic aluminum compound is one or more selected from the group consisting of alkyl aluminoxane, alkylaluminum and alkylaluminum halides; and/or

the organic boron compound is selected from the group consisting of arylboron

and borate.

~~15~~14. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-14~~, wherein a concentration of the first~~main~~ catalyst in the reaction system is 0.00001-100mmol/L; when the co-catalyst is the organic aluminum compound, a molar ratio of aluminum in the co-catalyst and M in the first~~main~~ catalyst is ~~(~~10:1 to~~-~~ 10000000~~)~~:1; and when the co-catalyst is the organic boron compound, a molar ratio of boron in the co-catalyst and M in the first~~main~~ catalyst is ~~(~~0.1:1 to ~~-~~1000~~)~~:1.

~~16~~15. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-15~~, wherein the chain transfer agent is one or more selected from the group consisting of aluminum alkyl, magnesium alkyl, and zinc alkyl~~, preferably trialkylaluminum and/or dialkyl zinc~~.

~~17~~16. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-16~~, wherein a molar ratio of the chain transfer agent and M in the first~~main~~ catalyst is ~~(~~0.1:1 to ~~-~~2000~~)~~:1.

~~18~~17. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-17~~, wherein a concentration of an olefinic alcohol monomer ~~shown in~~of Formula II in the reaction system is 0.01-6000 mmol/L.

~~19~~18. The preparation method according to ~~any of~~ claim~~s~~ ~~9~~8~~-18~~, wherein reaction conditions comprise: a reaction temperature ranging from -50 °C. to 50 °C., and/or a reaction time of 10-200min.

~~20~~19. A foaming polyolefin material comprising the copolymer~~Use of the copolymer~~ according to ~~any of~~ claim~~s~~ 1~~-8 or the copolymer obtained from the preparation method according to any of claims 9-19 as a foaming polyolefin material~~.

20. The copolymer according to claim 1, wherein, in Formula I, L1 and L2 are H, L3 is selected from the group consisting of H, C_1-C_{10} alkyl, and C_1-C_{10} alkyl substituted by halogen, L4 is a C_1-C_{10} alkylene having a side group.

21. The copolymer according to claim 20, wherein the side group is one or more

selected from the group consisting of halogen, C_6-C_{10} aryl, and C_1-C_{10} alkyl.

22. The copolymer according to claim 1, wherein a volume of the cavity in the spherical polymer having a cavity therein is 30-95%.

23. The copolymer according to claim 1, wherein, in the copolymer, a content of the structural unit derived from the olefinic alcohol of Formula I is 0.7-10.0 mol %.