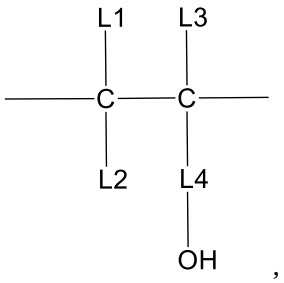
Claims

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 a cavity therein,

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



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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 a density of the polymer particles is 0.3000-0.7500g/cm^3, measured according to GB/T6343-2009.

3. The copolymer according to claim 1, wherein an average particle size of the plurality of polymeric particles is 0.1-50.0mm; and/or a volume of the cavity in each polymeric particle is 5-99% of a volume of the polymer particle.

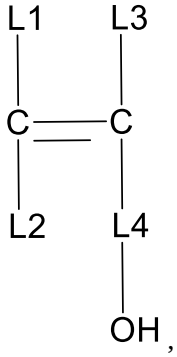
4. The copolymer according to claim 1, wherein each polymeric particle comprises a plurality of microsphere particles; and based on a total weight of the copolymer, a content of the plurality of particles is 5-70wt%.

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

6. 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 0.4-30.0mol%.

7. The copolymer according to claim 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.

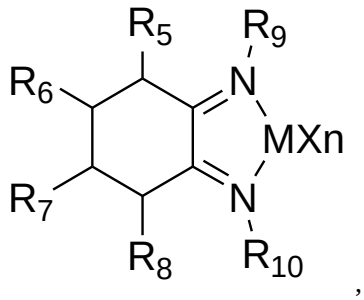
8. A preparation method for the olefin-olefinic alcohol copolymer according to claim 1, comprising contacting an olefin and an olefinic alcohol of Formula II with a catalyst and optionally a chain transfer agent for reaction in the presence of an alkane solvent in a reaction system to obtain the copolymer;



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 a first catalyst and a co-catalyst, wherein the first catalyst is one or more metal complex of Formula III:



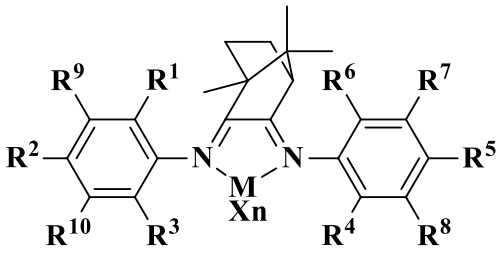
Formula III

wherein, in Formula III, R_9 and R_{10} each 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 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.

9. The preparation method according to claim 8, wherein, in Formula III, R_9 and R_{10} each 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 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.

10. The preparation method according to claim 8, wherein the 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 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, R^4-R^6, R^7, and R^8 optionally forming a ring; and M, X, and n have the same definitions as those in Formula III.

11. The preparation method according to claim 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 is independently selected from the group consisting of H and C_1-C_6 alkyl.

12. The preparation method according to claim 8, wherein the M is nickel.

13. The preparation method according to claim 8, 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.

14. The preparation method according to claim 8, wherein a concentration of the first 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 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 catalyst is 0.1:1 to 1000:1.

15. The preparation method according to claim 8, wherein the chain transfer agent is one or more selected from the group consisting of aluminum alkyl, magnesium alkyl, and zinc alkyl.

16. The preparation method according to claim 8, wherein a molar ratio of the chain transfer agent and M in the first catalyst is 0.1:1 to 2000:1.

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

18. The preparation method according to claim 8, wherein reaction conditions comprise: a reaction temperature ranging from -50 ^{o}C. to 50 ^{o}C., and/or a reaction time of 10-200min.

19. A foaming polyolefin material comprising the copolymer according to claim 1.

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 %.