CLAIMS

What is claimed is:

~~1. A method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor, comprising the following steps: (1) reacting a metal precursor with an alkaline substance to obtain a slurry containing insoluble compound, followed by filtering and washing the slurry; (2) adding an appropriate amount of a binder and deionized water, followed by sufficient agitation to regulate the solid content of the slurry to 10-50%, preferably 20-45%, wherein the percentage is calculated by mass; (3) subjecting the slurry obtained in step (2) to spray drying granulation in a spray drying granulation device, wherein the temperature at the feed port is controlled between 200-400°C, preferably 220-350°C, and the temperature at the discharge port is controlled between 100-160°C, preferably 110-150°C to obtain catalyst microspheres having a preferred particle size of 20-600μm; and (4)drying and calcining the catalyst microspheres to obtain a catalyst having a general formula of $FeX_aY_bZ_eO_d$, wherein X is one or more of Ni, Co, Zn, Cu, Sn, Mn, Y is one or more of Bi, Mo, Cr, V, La, Zr, Z is one or more of Mg, Ca, Sr, Ba, a is 0.1-3, b is 0-1, e is 0-1, and the value of d depends on the valence requirement of the other metal elements.~~

~~2. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the reaction between the metal precursor and the alkaline substance is carried out at a temperature of 10-90°C, preferably 30-80°C, and a pH of 5-11.~~

~~3. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the slurry in step (1) is filtered and washed to a pH of 7-7.5.~~

~~4. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein~~

~~the catalyst microspheres are dried in step (4) at a temperature of 80-200°C, preferably 80-180°C for 1-24h, preferably 4-16h.~~

~~5. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the catalyst microspheres are calcined in step (4) at a temperature of 500-900°C, preferably 520-820°C for 4-24h, preferably 4-18h.~~

~~6~~1. A method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor, comprising the following steps: (1) reacting a metal precursor with an alkaline substance at a temperature of 10-90°C~~, preferably 30-80°C,~~ and a pH of 5-11 to obtain a slurry containing insoluble compound, followed by filtering and washing the slurry to a pH of 7-7.5; (2) adding an appropriate amount of a binder and deionized water, followed by sufficient agitation to regulate the solid content of the slurry to 10-50%~~, preferably 20-45%~~, wherein the percentage is calculated by mass; (3) subjecting the slurry obtained in step (2) to spray drying granulation in a spray drying granulation device, wherein the temperature at the feed port is controlled between 200-400°C, ~~preferably 220-350°C,~~ and the temperature at the discharge port is controlled between 100-160°C, ~~preferably 110-150°C~~ to obtain catalyst microspheres ~~having a preferred particle size of 20-600μm~~; and (4) drying the catalyst microspheres at a temperature of 80-200°C~~, preferably 80-180°C~~ for 1-24h~~, preferably 4-16h~~, and then calcining the catalyst microspheres at a temperature of 500-900°C~~, preferably 520-820°C~~ for 4-24h~~, preferably 4-18h~~ to obtain a catalyst having a general formula of $FeX_aY_bZ_cO_d$, wherein X is one or more of Ni, Co, Zn, Cu, Sn, Mn, Y is one or more of Bi, Mo, Cr, V, La, Zr, Z is one or more of Mg, Ca, Sr, Ba, a is 0.1-3, b is 0-1, c is 0-1, and the value of d depends on the valence requirement of the other metal elements.

~~7~~2. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1~~ or 6~~, wherein the metal precursor is selected from a group consisting of nitrates, chlorides,

sulfates, hydroxides, oxides, ammonium metallates, and ~~, and~~ a mixture of two or more of the above substances.

~~8~~3. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1 ~~or 6~~, wherein the alkaline substance is selected from a group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate, sodium dicarbonate, potassium carbonate, potassium dicarbonate, ammonia, urea, and a mixture of two or more of the above substances.

~~9~~4. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1 ~~or 6~~, wherein the reaction between the metal precursor and the alkaline substance is carried out by adding the metal precursor dropwise to the alkaline substance, or adding the alkaline substance dropwise to the metal precursor, or adding the metal precursor and the alkaline substance dropwise and concurrently, and controlling the final pH to 6-10.

5. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the metal precursor and the alkaline substance react at 30-80°C.

~~10~~6. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1 ~~or 6~~, wherein the binder selected from a group consisting of silica gel, alumina gel, methylcellulose, polyvinyl alcohol, sesbania powder, and a mixture of two or more of the above substances, and is added at an amount of 1-5% by mass.

7. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the solid content of the slurry is 20-45% by mass.

8. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the temperature at the feed port is 220-350°C, the temperature at the discharge port is 110-150°C, and microspheres having a particle size of 20-600μm are obtained.

9. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the drying is carried out at 80-180°C for 4-16h.

10. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the calcination is carried out at 520-820°C for 4-18h.

11. A catalyst prepared according to the method of claim 1 ~~or 6~~ for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor, wherein the catalyst has a general formula of $FeX_aY_bZ_cO_d$, wherein X is one or more of Ni, Co, Zn, Cu, Sn, Mn, Y is one or more of Bi, Mo, Cr, V, La, Zr, Z is one or more of Mg, Ca, Sr, Ba, a is 0.1-3, b is 0-1, c is 0-1, and the value of d depends on the valence requirement of the other metal elements.

12. A method of preparing 1,-3-butadiene using the catalyst of claim 11, wherein a reaction is carried out at a temperature of 300-400°C and the ambient pressure in the presence of the catalyst of claim 11 to obtain 1,3-butadiene, wherein the molar ratio of water to butene is 6-16, the molar ratio of oxygen to butene is 0.4-1.0, and the volume space velocity of butene is 100-600h^{-1}.

CLAIMS

What is claimed is:

1. A method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor, comprising the following steps: (1) reacting a metal precursor with an alkaline substance at a temperature of 10-90°C and a pH of 5-11 to obtain a slurry containing insoluble compound, followed by filtering and washing the slurry to a pH of 7-7.5; (2) adding an appropriate amount of a binder and deionized water, followed by sufficient agitation to regulate the solid content of the slurry to 10-50%, wherein the percentage is calculated by mass; (3) subjecting the slurry obtained in step (2) to spray drying granulation in a spray drying granulation device, wherein the temperature at the feed port is controlled between 200-400°C, and the temperature at the discharge port is controlled between 100-160°C, to obtain catalyst microspheres; and (4) drying the catalyst microspheres at a temperature of 80-200°C for 1-24h, and then calcining the catalyst microspheres at a temperature of 500-900°C for 4-24h to obtain a catalyst having a general formula of $FeX_aY_bZ_cO_d$, wherein X is one or more of Ni, Co, Zn, Cu, Sn, Mn, Y is one or more of Bi, Mo, Cr, V, La, Zr, Z is one or more of Mg, Ca, Sr, Ba, a is 0.1-3, b is 0-1, c is 0-1, and the value of d depends on the valence requirement of the other metal elements.

2. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the metal precursor is selected from a group consisting of nitrates, chlorides, sulfates, hydroxides, oxides, ammonium metallates, and a mixture of two or more of the above substances.

3. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the alkaline substance is selected from a group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate, sodium dicarbonate, potassium carbonate,

potassium dicarbonate, ammonia, urea, and a mixture of two or more of the above substances.

4. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the reaction between the metal precursor and the alkaline substance is carried out by adding the metal precursor dropwise to the alkaline substance, or adding the alkaline substance dropwise to the metal precursor, or adding the metal precursor and the alkaline substance dropwise and concurrently, and controlling the final pH to 6-10.

5. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the metal precursor and the alkaline substance react at 30-80°C.

6. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the binder selected from a group consisting of silica gel, alumina gel, methylcellulose, polyvinyl alcohol, sesbania powder, and a mixture of two or more of the above substances, and is added at an amount of 1-5% by mass.

7. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the solid content of the slurry is 20-45% by mass.

8. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the temperature at the feed port is 220-350°C, the temperature at the discharge port is 110-150°C, and microspheres having a particle size of 20-600μm are obtained.

9. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the drying is carried out at 80-180°C for 4-16h.

10. The method of preparing a catalyst for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor according to claim 1, wherein the calcination is carried out at 520-820°C for 4-18h.

11. A catalyst prepared according to the method of claim 1 for preparation of butadiene by oxydehydrogenation of butene in a fluidized bed reactor, wherein the catalyst has a general formula of $FeX_aY_bZ_cO_d$, wherein X is one or more of Ni, Co, Zn, Cu, Sn, Mn, Y is one or more of Bi, Mo, Cr, V, La, Zr, Z is one or more of Mg, Ca, Sr, Ba, a is 0.1-3, b is 0-1, c is 0-1, and the value of d depends on the valence requirement of the other metal elements.

12. A method of preparing 1,3-butadiene using the catalyst of claim 11, wherein a reaction is carried out at a temperature of 300-400°C and the ambient pressure in the presence of the catalyst of claim 11 to obtain 1,3-butadiene, wherein the molar ratio of water to butene is 6-16, the molar ratio of oxygen to butene is 0.4-1.0, and the volume space velocity of butene is 100-600h^{-1}.