Claims

1. A hydrocracking catalyst, comprising a support, an active metal component, and carbon,

wherein, based on a total weight of the catalyst, a content of the support is 60 to 90 wt%, a content of the active metal component calculated in metal oxides is 15 to 40 wt%, and a content of carbon calculated in C element is 1 to 5 wt%;

wherein, measured with an infrared acidimetric estimation method, the catalyst has a total infrared acid of 0.4 to 0.8 mmol/g, an infrared acid amount of strong acid with desorption temperature greater than 350°C of 0.08 mmol/g or lower, and a ratio of the total infrared acid amount to the infrared acid amount of strong acid with desorption temperature greater than 350°C of 5 to 50,

wherein metal in the active metal component is selected from the group consisting of VIII metal elements and VIB metal elements, and a content of the VIII metal elements calculated in metal oxides is 2 to 15 wt%, and the content of the VIB metal elements calculated in metal oxides is 10 to 30 wt%,

wherein, on the surface of the catalyst, an atomic ratio of the VIII metal elements to Al is (0.2 to 0.5):1 and an atomic ratio of the VIB metal elements to Al is (0.4 to 0.8):1.

2. The catalyst according to claim 1, wherein the support is a silica-alumina support that contains a modified Y-type molecular sieve, and, based on the total weight of the support, the support contains 20 to 85 wt% modified Y-type molecular sieve and 15 to 80 wt% amorphous silica-alumina and/or alumina,

wherein the modified Y-type molecular sieve is a Y-type molecular sieve modified by dealumination and silicon reinsertion and/or hydrothermal treatment of ammonium fluosilicate, and a molar ratio of SiO_2/Al_2O_3 in the modified Y-type molecular sieve is (5 to 15):1.

3. The catalyst according to claim 1, wherein the content of carbon calculated in

C element is 1 to 3 wt%, the total infrared acid amount is 0.4 to 0.6 mmol/g and the ratio of the total infrared acid amount to the infrared acid amount of strong acid with desorption temperature greater than 350°C is 8 to 30.

4. The catalyst according to claim 1, having a specific surface area of 200 to 400 m^2/g, and a pore volume of 0.25 to 0.38 ml/g.

5. A method for preparing a hydrocracking catalyst, comprising the following steps:

(1) contacting a support with a carbon source and causing a carbon deposition reaction to obtain a carbonized support;

(2) roasting the carbonized support in an oxygen-containing gas at 250°C to 390°C for 3.5 to 20 hrs. to obtain a decarbonized support, wherein a carbon content in the decarbonized support is 20 to 80% of a carbon content in the carbonized support, wherein the oxygen content in the oxygen-containing gas is 0.5 to 8 vol%;

(3) introducing a precursor of active metal component into the decarbonized support, and drying the decarbonized support; and

(4) treating the product obtained in step (3) through a heat treatment process, in which the precursor of active metal component is converted into active metal oxides;

wherein the hydrocracking catalyst contains 1 to 5 wt% carbon calculated in C element, 60 to 90 wt% support, and 15 to 40 wt% active metal component calculated in metal oxides,

wherein, in step (1), the sub-step of contacting the support with the carbon source is carried out at a pressure of 0.1 to IMPa for 0.1 to 6 hrs., the carbon deposition reaction is carried out in an oxygen-containing atmosphere at 100°C to 500°C. for 20 to 200 hrs., wherein an oxygen content of the oxygen-containing atmosphere is 10 to 100 vol%.

6. The method according to claim 5, wherein the support is a silica-alumina support that contains a modified Y-type molecular sieve, and, based on the total weight

of the support, the support contains 20 to 85 wt% modified Y-type molecular sieve and 15 to 80 wt% amorphous silica-alumina and/or alumina; wherein the modified Y-type molecular sieve is a Y-type molecular sieve modified by dealumination and silicon reinsertion and/or hydrothermal treatment of ammonium fluosilicate, and a molar ratio of SiO_2/Al_2O_3 in the modified Y-type molecular sieve is (5 to 15):1.

7. The method according to claim 6, wherein, in step (1), the support is obtained by mixing the modified Y-type molecular sieve with amorphous silica-alumina and/or alumina homogeneously, extruding the mixture into strips, and then drying and roasting the strips.

8. The method according to claim 5, wherein the carbon source is selected from the group consisting of petroleum ether, benzene, methyl benzene, dimethyl benzene, catalytic gasoline, coker gasoline, butadiene, pentylene, hexadiene, butylene, pentene, heptylene, nonylene, and mixtures thereof.

9. The method according to claim 5, wherein, in step (2), the oxygen-containing gas comprises 2 to 5 vol% of oxygen and at least one selected from the group consisting of CO_2, N_2, He, Ne, and Ar.

10. The method according to claim 5, wherein, in the step (2), the carbonized support is loaded into a roasting furnace and heated up from room temperature to the roasting temperature at a heating rate of 20 to 40°C/hr, and kept at the roasting temperature for the duration of the roasting time, the and a volume ratio of the oxygen-containing gas to the carbonized support is (500 to 5,000):1.

11. The method according to claim 5, wherein, in step (3), the precursor of active metal component is introduced by impregnating the decarbonized support in an impregnation liquid that contains the precursor of active metal component and wherein the drying is carried out at 90°C to 150°C for 2 to 8 hrs.

12. The method according to claim 5, wherein the heat treatment process comprises roasting the product obtained from step (3) in an inert gas at 400°C to 700°C for 2 to 10 hrs to obtain the hydrocracking catalyst.

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13. The method according to claim 5 wherein the heat treatment process comprises activating the product obtained from step (3) in an oxygen-containing atmosphere at 150°C to 300°C for 1 to 5 hrs to obtain the hydrocracking catalyst.