Claims

1. A ZSM-23 zeolite, which is characterized in that the total acid amount of said ZSM-23 zeolite is 0.05-0.25 mmol/g, preferably, 0.06-0.22 mmol/g, more preferably, 0.06-0.20 mmol/g; the strong acid content of said ZSM-23 zeolite is 10-28% of the total acid amount; wherein the strong acid refers to an acid having a desorption temperature of 350°C or higher in an NH3 temperature programmed desorption (NH3-TPD), wherein optionally said ZSM-23 zeolite is a dried and calcined zeolite.

2. The zeolite according to any of the previous claims, which is characterized in that the ZSM-23 zeolite has a grain size of 100-700 nm, preferably 200-600 nm, and further preferably 300-500 nm.

3. The zeolite according to any of the previous claims, which is characterized in that said ZSM-23 zeolite has a SiO_2/Al_2O_3 molar ratio of 35-300, a specific surface area of 200-400 m^2/g, and a pore volume of 0.25-0.50 cm^3/g; preferably, said ZSM-23 zeolite has a SiO_2/Al_2O_3 molar ratio of 38-200, a specific surface area of 280-370 m^2/g, and a pore volume of 0.28-0.40 cm^3/g.

4. The zeolite according to any of the previous claims, which is characterized in that said ZSM-23 zeolite has a relative crystallinity of 95-130% after calcination, and a relative crystallinity of 93-120% after a hydrothermal treatment with steam for 2 hours at 600°C; preferably a relative crystallinity of 98-120% after calcination, and a relative crystallinity of 95-115% after a hydrothermal treatment with steam for 2 hours at 600°C.

5. A process for preparing said ZSM-23 zeolite according to any of the precedent claims, which is characterized in that the process comprises the following steps:

(1) A mixed solution containing a template agent, and an amorphous silica-alumina and/or amorphous silica-alumina precursor is prepared, preferably, the amorphous silica-alumina and/or amorphous silica-alumina precursor is derived from an alkaline aluminum source (for example, an aluminate or a meta-aluminate, such as sodium aluminate, potassium aluminate, sodium meta-aluminate, and potassium meta-aluminate), in said mixed solution the molar ratio of silicon (as silica) : aluminum (as alumina) is 1:(0.10-0.85), the molar ratio of said aluminum (as alumina) : the template agent is 1:(10-100);

(2) An alkali source and a silicon source are added to the mixed solution of step (1), based on the aluminum (as alumina) in the mixed solution of step (1), based on the total charging molar ratios of SiO_2:Al_2O_3:R_2O(an alkali source, wherein R is an alkali metal, such as sodium and potassium):H_2O = 1:(0.0025-0.025):(0.015-0.08):(30-80) and template agent (SDA)/SiO_2 = 0.10-1.8, the alkali source and the silicon source are added to step (1);

(3) The material obtained in step (2) is crystallized, optionally filtered and washed, dried, and optionally calcined to produce the ZSM-23 zeolite, the crystallization is performed at 150-200°C for 8-72 hours.

6. The process according to claim 5, which is characterized in that in step (1), said template agent is one or more of isopropylamine, pyrrolidine, N,N-dimethyl formamide, and dimethylamine.

7. The process according to any of claims 5-6, which is characterized in that in step (1), in said mixed solution the molar ratio of silicon (as silica) : aluminum (as alumina) is 1:(0.20-0.79), preferably 1:(0.24-0.78); the molar ratio of said aluminum (as alumina) : the template agent is 1:(15-85), preferably 1:(20-65).

8. The process according to any one of claims 5-7, which is characterized in that in step (1), an amorphous silica-alumina precursor is prepared by carbonization method, and then a template agent is added to the amorphous silica-alumina precursor to produce the mixed solution, wherein the preparation process of the amorphous silica-alumina precursor in step (1) is as follows: preparing a solution of an aluminum source (such as aluminate, preferably sodium aluminate) and a solution of a silicon-containing compound respectively; mixing the solution of the aluminum source with a part of the solution of the silicon-containing compound, introducing a CO_2 gas for gelatination, when the volume of the introduced CO_2 gas is 50-100%, preferably 70-90% of the total volume of the introduced CO_2 gas, adding the remaining part of the solution of the silicon-containing compound, and optionally aging to produce the amorphous silica-alumina precursor.

9. The process according to claim 8, which is characterized in that the remaining part of the solution of the silicon-containing compound as silica comprises 5-85wt%, preferably 30-70wt% of the total addition amount of the solution of the silicon-containing compound as silica.

10. The process according to any of claims 8-9, which is characterized in that the reaction temperature of said gelatination is 10-40°C, preferably 15-35°C, the pH after the gelatination is controlled to 9-12.

11. The process according to any of claims 8-10, which is characterized in that said solution of the silicon-containing compound is water glass and/or a sodium silicate solution.

12. The process according to any of claims 8-11, which is characterized in that based on the mass of Al_2O_3, the concentration of the solution of the aluminum source is 15-60 gAl_2O_3/L, based on the mass of SiO_2, the concentration of said solution of the silicon-containing compound is 40-260 gSiO_2/L, the concentration of said CO_2 gas is 30-60 v%.

13. The process according to any of claims 8-12, which is characterized in that the time of said ageing is 5-60 minutes, preferably 10-30 minutes; the temperature of said aging is 10-40°C, preferably 15-35°C.

14. The process according to any of claims 5-13, which is characterized in that in step (1), said mixed solution is stirred at 10-35°C for 0.2-1.5 hours, preferably stirred at 10-25°C for 0.5-1 hours.

15. The process according to any of claims 5-14, which is characterized in that in step (2), SiO_2/Al_2O_3 is 50-200, H_2O/SiO_2 is 30-60, and R_2O/SiO_2 is 0.025-0.06.

16. The process according to any of claims 5-15, which is characterized in that in step (2), said silicon source is one or more of fumed silica, silica sol and water glass, said alkali source is one or more of sodium hydroxide, potassium hydroxide, and ammonia water.

17. The process according to any of claims 5-16, which is characterized in that in step (3), the crystallization is performed at 160-180°C for 10-48 hours; the drying is performed at 60-130°C for 2-12 hours, preferably at 80-120°C for 4-8 hours; the calcining is performed at 500-600°C for 2-8 hours, preferably at 530-570°C for 3-6 hours or 4-6 hours.