Abstract

The present invention discloses a ZSM-5 molecular sieve, its preparation method, and a lightening method. The total specific surface area of the ZSM-5 molecular sieve is 300-500 m^2/g, wherein the external specific surface area accounts for 33%-45% of the total specific surface area, and in the ^{27}Al NMR spectrum of the ZSM-5 molecular sieve, the peak area of the peak at a chemical shift of 53 ppm is ≥50% relative to the peak area of tetra-coordinated Al. A preparation method of the ZSM-5 molecular sieve includes: S1. mixing a first silicon source, a first template, a first alkali source, and water to obtain a seed gel; wherein the first silicon source is a solid silicon source; S2. mixing a second silicon source, an aluminum source, a second template, a second alkali source, water, and the seed gel to obtain a synthesis solution; S3. subjecting the synthesis solution to crystallization treatment to obtain the ZSM-5 molecular sieve. The present invention also relates to a catalyst based on the ZSM-5 molecular sieve and a method to lighten light hydrocarbons and naphtha using the catalyst based on the ZSM-5 molecular sieve. The ZSM-5 molecular sieve of the present invention has a specific external surface area ratio, making it suitable as a component of a lightening catalyst of naphatha. A catalyst prepared from the molecular sieve can significantly increase the yield of cracking feedstocks under low hydrogen-to-oil volume ratio conditions.

Fig. 11