

عنوان مقاله:

Synthesis Parameters Influencing the Crystal Size of Silicalite-1 Seed: A Short Review

محل انتشار:

اولین کنگره و نمایشگاه بین المللی علوم و تکنولوژی های نوین (سال: 1397)

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خلاصه مقاله:

Zeolite crystals have been widely used as heterogeneous catalysts in the petrochemical and fine chemical industries. Among the catalysts for methanol-to-olefin reactions, the ZSM-5 zeolite is the most used due to its particular advantages of its acidity, special pore structure, and high thermal stability. In conventional methods, synthesis of ZSM-5 is achieved by using an expensive organic structure directing agent like tetrapropylammonium hydroxide (TPAOH) and tetrapropylammonium bromide (TPABr). The use of these expensive organic templates in the synthesis of ZSM-5 not only increases the zeolite cost but also causes production of harmful gases (mainly NO_x and CO₂) as a result of removing the organic templates by combustion at high temperature. To overcome these problems, ZSM-5 is synthesized by adding high silica seeds without using any extra template. Moreover, by adding seed crystals into the synthesis batches, both the particle size and morphology of product zeolites can be controlled well. This cost-effective and green route which offers a powerful method to produce zeolites with well-controlled sizes, shapes, compositions, and structures, has become increasingly important in the last few years. Many researchers studied the synthesis conditions of ZSM-5 zeolite which produced with seed assisted method but there are only few articles focused on seed as a separate part. It was observed that crystalline seed in the synthesis of ZSM-5 can be structurally related zeolite species like ZSM-5, ZSM-8, ZSM-11 or non-zeolite species with somewhat similar crystal morphology like silicalite. Silicalite-1 is a microporous polymorph of silica with MFI structure which is synthesized from clear solution method which based on mixing a silica source, an alkali source, water and an organic structure directing agent like TPAOH. There are effective factors such as silica source, TPAOH content, crystallization time, crystallization temperature and water content which affect the crystal size of the silicalite-1 seed. This paper reviews the effect of these different parameters in the synthesis of silicalite-1 seed and discusses the effect of these factors on the crystal size of the seed. It should be pointed out that there is a linear relationship between the size of final ZSM-5 zeolite and size of the added seed. The crystal size of ZSM-5 affects on other physical properties, including a large increase of both total and external surface area when crystal size decreases. The main purpose of this paper is to propose an ... optimal condition in order to achieve small seed crystals

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