RECENT DEVELOPMENTS IN DESIGN OF POROUS MATERIALS

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Abstract

Zeolites are a class of crystalline porous materials composed of tetrahedra forming three-dimensional array of channels and cavities. They are widely used in all fields of human activities, from large industrial facilities to households. In addition, new usage options are continuously investigated. Zeolite synthesis is recognized as a "geoinspired" process based on the hydrothermal treatment of Al- and Si-containing precursors in alkaline solutions at reaction temperatures up to 250 ºC, generally conducted in autoclaves placed in ovens. Developing milling processes to produce zeolite materials is recognized as a crucial endeavour from environmental, technological, and materials engineering perspectives.

Herein are going to be given accounts that may result in achieving favorable circumstances to perform successful mechanosynthesis of zeolites using soluble and/or amorphous source chemicals. In this context, various zeolite materials (MER-, CAN-, SOD-, MFI-, MOR-, CHA-type) were prepared via thermomilling treatment and characterized by a set of complementary techniques (XRD, NMR, IR, AFM, SEM, TEM, LLS) which enabled drawing conclusions on the underlying processes occurring during their formation. Additionally, examples of oven-based zeolite syntheses that serve as reference point for the ones conducted under milling conditions are going to be demonstrated.

Keywords: zeolites, mechanochemistry, formation mechanism.