Hydrothermal Crystallization and Characterization of R^{+3}: $AlPO_4$ Zeolites, where R=Ce, Pr and Nd

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Zeolites are the most important technological materials made up of framework of aluminosilicates, aluminophosphates, vanadophosphates, silicoaluminophosphates and so on. In the recent years the interest is being extended greatly from the molecular sieves to selective catalysis, gas adsorption, nanoparticle hosts, atmospheric ecosystems, etc. These aluminophosphate molecular sieve zeolites have uni-, two-, and three-dimensional channels which are obtained hydrothermally in the presence of organic amines as structure directing agents. VPI-5 is an important aluminophosphate molecular sieve with 18 tetrahedral rings and free diameter of 12.1 Å. In this paper, the authors discuss the synthesis of R^{+3}: aluminophosphate, where R=Ce, Pr and Nd. The addition of R^{+3} into the aluminophosphate framework not only enhances the stability of the framework, but also enlarges the pore diameter, which helps in the sieving of large molecules. Further, the efficiency of the catalytic activity can be elevated. The materials obtained have been subjected to a systematic characterization using Powder XRD, IR, SEM, BET and Positron Annihilation Life time measurements. The preliminary investigation shows that the following results: FTIR spectra show that the R^{+3} is inserted into the $AlPO_4$ pores. Cell volume has increased considerably with the insertion of R+3 elements into zeolites framework. Consequently the surface area decreased. Positron annihilation lifetime spectroscopy data show that micro void content increases as the surface area decreases.

Keywords: $AlPO_4$ zeolites, hydrothermal crystallization, rare earth elements