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Ionothermal Synthesis and Characterization of CoAPO-34 Molecular Sieve

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Abstract

The cobalt-doped aluminophosphate molecular sieve, CoAPO-34 (with the chabazite-type topology) was prepared under ionothermal conditions using 1-ethyl-3-methylimidazolium bromide (EMIMBr) ionic liquid in presence of 1,6-hexanediamine (HDA). The HDA is not incorporated in CoAPO-34, but is required to mediate the availability of Co^{2+} during the synthesis. The material was characterized using powder X-ray diffraction (PXRD), thermogravimetric analysis (TGA) and solid-state NMR spectroscopy. Wideline ^{31}P NMR spectroscopy showed broad signals (~5000–10000 ppm wide), confirming that paramagnetic cobalt ions are successfully incorporated within the framework of the materials.

1. Introduction

Zeolites and related zeotype molecular sieves are inorganic materials with many industrial applications, such as gas absorption, ion exchange and catalysis. Aluminophosphates (AlPOs) are a family of zeotypes with properties similar to zeolites, and which may find use as catalysts and absorbents for molecular separation.[1,2] However, as AlPOs contain strictly-alternating AlO_4 and PO_4 tetrahedra, the materials have a neutral framework charge and, consequently, lack acid sites, meaning that they cannot be used directly as catalysts. Aliovalent substitution of Al^{3+} or P^{5+} with other heteroatoms such as Si^{4+} , Mg^{2+} , Co^{2+} , Mn^{2+} , Zn^{2+} , *etc.* to produce silicoaluminophosphates (SAPOs) or metallo-aluminophosphates (MAPOs), respectively,

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