

Si distribution in silicoaluminophosphate molecular sieves with the LEV topology: a solid-state NMR study

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Elucidating the manner in which various possible framework elements, e.g., Si, Al, P, Ga, Ge, Li, etc., are spatially distributed over the available T-sites in zeolites and molecular sieves is of fundamental importance in manipulating their physicochemical and catalytic properties of at the molecular level. Microporous silicoaluminophosphate (SAPO) materials are a new family of molecular sieves discovered by Union Carbide in 1984. Unlike the case of silica frameworks, however, the question of the preference of Si atoms of particular T-sites in SAPO molecular sieves still remains to be answered. SAPO-35 is a member of the SAPO family and is isostructural with the natural zeolite levyne (LEV topology) where only two distinct T-sites (i.e. T₁ and T₂ with multiplicities of 36:18) exist. This has led us to consider SAPO-35 as a good example of proving whether the location of Si atoms in microporous SAPO materials with multiple T-sites is spatially ordered. Here we present the ²⁹Si and ³¹P MAS NMR results showing that substitution of Si atoms on the two distinct T-sites of the SAPO-35 framework during the crystallization process occurs in a nonrandom manner.