

A Family of Molecular Sieves Containing Framework-Bound Organic Structure-Directing Agents

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Organic structure-directing agents (OSDAs), such as quaternary ammonium cations and amines, used in the synthesis of zeolites and related crystalline microporous oxides usually end up entrapped inside the void spaces of the crystallized inorganic host lattice. But none of them is known to form direct chemical bonds to the framework of these industrially important catalysts and adsorbents. We demonstrate that ECR-40, currently regarded as a typical silicoaluminophosphate molecular sieve, constitutes instead a new family of inorganic-organic hybrid networks in which the OSDAs are covalently bonded to the inorganic framework. ECR-40 crystallization begins with the formation of an Al-OSDA complex in the liquid phase in which the Al is octahedrally coordinated. This unit is incorporated in the crystallizing ECR-40. Subsequent removal of frameworkbound OSDAs generates Al-O-Al linkages in a fully tetrahedrally coordinated framework.