Multiple Inorganic Cation Approach for the Synthesis of New Zeolites

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Zeolites are of major importance for applications ranging from ion-exchange to adsorption and to catalysis. Because their unique shape-selective properties are closely related to the size, shape, and dimensionality of the intracrystalline channels and cavities, much interest has been devoted to the discovery of novel zeolitic materials. Over the last several decades, in fact, both structural and compositional regimes of crystalline microporous materials have been greatly extended. However, these newly discovered zeolites tend to be (hydro)thermally unstable and are often commercially impractical from a manufacturing perspective because of the high cost of the OSDA and/or heteroatom employed.

We recently focused on inorganic synthesis parameters as the key phase selectivity factor, especially the cooperative structure direction among the multiple inorganic cations in the presence of known OSDAs, that has received relatively little attention in the search for new zeolites. This has led us to find several novel aluminosilicate zeolites such as PST-20, PST-29 (PWN), and PST-32. Here we present their syntheses, structures, catalytic or adsorption properties.