

Synthesis and characterization of a gallosilicate analog of zeolite paulingite

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The natural zeolite paulingite (framework type PAU) is a small-pore material with the unit cell (672 tetrahedral atoms) in which at least three different types of cavities can be distinguished. Therefore, this material can also be regarded as one of the most complex and fascinating structures discovered thus far. Isomorphous substitution of Al by this element in the zeolite framework has been the subject of a number of previous studies. However, no systematic studies on the synthesis of a gallosilicate analog of paulingite have been carried out yet. Here we describe the synthesis of a gallosilicate analog of zeolite paulingite through the combined use of sodium, potassium, and tetraethylammonium ions as structure-directing agents. Under the synthesis conditions studied here, the gel composition range yielding pure gallosilicate paulingite was found to be very narrow, which is the same trend as that observed for the synthesis of its aluminosilicate analog, i.e., ECR-18. The presence of Ga in the tetrahedral framework positions of this gallosilicate is evidenced by a combination of IR and ²⁹Si and ⁷¹Ga MAS NMR spectroscopies.