

Synthesis of Gallosilicate Gonnardite Zeolite and Its Transformation to KAlGeO_4 -Type Kalsilite

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A gallosilicate analog of the natural zeolite gonnardite with the NAT topology and with complete disorder in tetrahedral sites has been hydrothermally synthesized in the presence of K^+ ions as a structure-directing agent. This material denoted as PST-1 was found to rapidly transform into the gallosilicate analog of kalsilite with the KAlGeO_4 -type hexagonal unit cell, named TNU-6, with prolonged heating in the crystallization medium. Analysis of both the synchrotron powder and single crystal diffraction data reveals the existence of an additional $\sqrt{3}a$ superstructure in TNU-6 generated by tilting of some of the tetrahedral units in all 6-membered rings. In situ high-temperature powder X-ray diffraction experiments shows that PST-1 transforms to a completely dehydrated phase even at 100 °C, accompanied by a volume reduction of 16.6%, and is thermally stable at temperatures at least up to 800 °C. The completely dehydrated PST-1 restores to its original state within 1h when exposed to ambient air.