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Variable-Temperature Experiments on Several Synthetic Zeolites in the Natrolite Family

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Several zeolites in the NAT topology with different framework/non-framework cations and water contents were synthesized under systematically varying hydrothermal conditions and characterized as a function of temperature using monochromatic synchrotron X-ray and Rietveld analyses. In potassium gallosilicate natrolite, the crystal water contents can be varied depending on the synthesis temperature, and the as-synthesized materials show preference for orthorhombic and tetragonal symmetry below and above room temperature, respectively. Above 400K, fully dehydrated phases are formed in tetragonal symmetry with a volume reduction of as much as 15 %. Sodium gallosilicate natrolite, on the other hand, do not show any changes from its orthorhombic symmetry in the temperature range between 50K and 550K, and progressive dehydration above 300K involves decrease in the *a*-/*b*-axes lengths and increase in the *c*-axis. The as-synthesized sodium aluminogermanate natrolite is monoclinic below room temperature, transforms to tetragonal thereafter, and fully-dehydrated above 500K with about 6% volume reduction. In all cases, the fully dehydrated materials transform back to their original states through rehydration over a period of up to a week. Detailed discussion of the cation-water interplay via phase transitions and dehydrations will be reported elsewhere.

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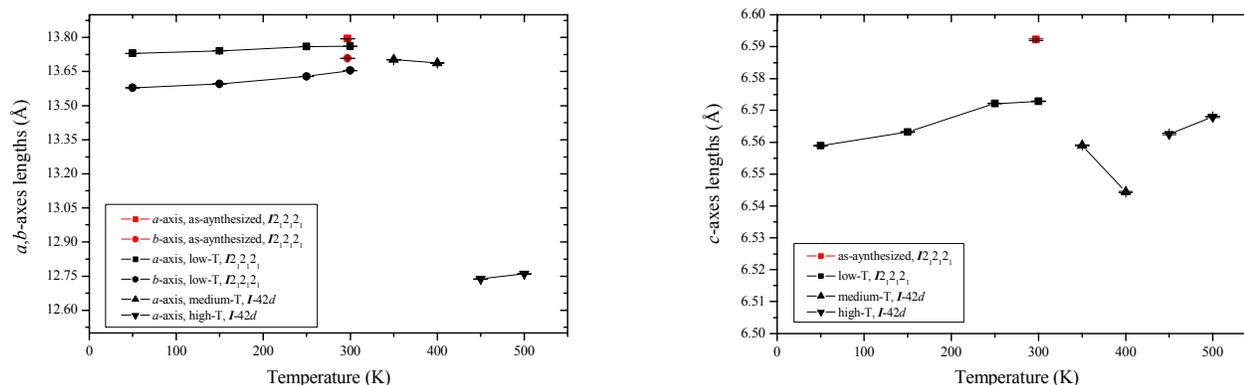


Figure. Temperature dependence of the unit cell edge lengths of synthetic natrolite, $K_{16}Ga_{16}Si_{24}O_{80} \cdot 32H_2O$