High temperature phase transitions in synthetic RbGaSi2O6 and RbFeSi2O6 leucite analogues

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Leucite ($KAlSi_2O_6$) [1] is a tetrahedrally coordinated silicate framework mineral. Synthetic analogues of leucite can be synthesised with stoichiometries of $A^+_2B^{2+}Si_5O_{12}$ or $A^+C^{3+}Si_2O_6$, some of the silicon framework cations partially replaced by divalent (*B*) or trivalent (*C*) cations. A monovalent extraframework alkali metal (*A*) cation is also incorporated in these structures to balance the charges. Ambient temperature structures of synthetic anhydrous leucite analogues (where *A* = K or Rb and *C* = Al, Ga or Fe^{3+}) all have $I4_1/a$ tetragonal structures [1-5] with **disordered** tetrahedrally coordinated sites (T-sites).

On heating these tetragonal leucites can undergo phase transitions to *Ia*-3*d* cubic. Phase transitions have been reported for $KCSi_2O_6$ [2, 4] and $RbAlSi_2O_6$ [4]. Two more $I4_1/a$ tetragonal to *Ia*-3*d* cubic phase transitions are reported after high temperature X-ray powder diffraction studies on $RbGaSi_2O_6$ (773K) and $RbFeSi_2O_6$ (673K).

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