

Kiglapait mineralogy V: Feldspars in a hot, dry magma

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ABSTRACT

The lithology of the 1.305 Ga Kiglapait intrusion is dominated by a Lower Zone of troctolite, succeeded by an Upper Zone of olivine gabbro, ferrodiorite, and syenite with olivine composition of pure fayalite. The feldspar composition of the intrusion varies from An₆₈ to An₉ over a thickness of 8.4 km from the base to a sandwich horizon under an Upper Border Zone. The anhydrous nature of the Kiglapait syenites is shown by their high temperature, by the loss of minor biotite up-stratigraphy in the intrusion, and the absence of amphibole. The end-stage feldspar of the Kiglapait syenites is that of a solidus embedded in a solvus in a 3 kbar eutectic at 1000 °C. The end-member assemblage at temperature and pressure is invariant. The final bulk composition is relatively An-rich—An ~11%—with a composition of $X_{Or} = 1/3$ when projected to the Ab-Or sideline. The experimental feldspar solvus when corrected for the effects of An and Ba and referred to 3 kbar penetrates the solidus and fits the experimental tie lines. These conditions precede a stage of local coarsening under subsolidus conditions that is found in colloform symplectites invading mesoperthite. The oligoclase-orthoclase symplectites are iso-compositional with their host mesoperthites. The coarsening is assumed to be related to a plausibly F-rich vapor phase that is locally consumed with time. The observed phase compositions indicate the end of exsolution at ~800 °C at 3 kbar on the binodal solvus.

Keywords: Feldspar compositions, Kiglapait Intrusion, chemistry, textures, exsolution, symplectite, coarsening, solvus, syenites, cooling history