

## **Kiglapait mineralogy IV: The augite series**

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### **ABSTRACT**

Based on twenty-five new chemical analyses, augites from the Upper Zone of the Kiglapait layered intrusion, Labrador, span the range from En<sub>73</sub> to En<sub>0</sub>, disposed about a straight line sloping slightly upward from Wo<sub>40</sub> to Wo<sub>42</sub> in the pyroxene quadrilateral. They contain little tetrahedral Al, which decreases with Fe enrichment as tetrahedral ferric Fe<sup>3+</sup> increases. Little or no jadeite or Ca-Tschermaks component is present. Titanium rises only slightly with Fe, and the acmite component is scattered near mole fraction 0.03. Excess cations relative to 6 oxygen atoms occur chiefly by solid solution toward olivine, the only co-crystallizing mafic silicate phase. Values of  $n_b$  increase linearly over the range 1.670 at fictive En<sub>100</sub> to 1.7448 at En<sub>0</sub>. The position of the 150 powder X-ray diffraction peak shifts regularly from 5.0372 to 4.1727 degrees away from the 220 peak of silicon metal over the same composition range. Exsolution of orthopyroxene near (100) is succeeded up-stratigraphy by that of pigeonite near (001), and the switch occurs at about the same augite composition as the switch from external orthopyroxene to pigeonite in the Skaergaard intrusion. Exsolution of ilmenite in or near (100) and magnetite-ulvöspinel near the **a** and **c** directions in (010) produces the black color of these augites in hand specimen. Subsolvus augite-olivine tie lines and exchange relations in Fe-Mg allow the distinction between equilibrium pairs and those affected by exchange with external Fe-Ti oxide minerals or with intercumulus liquid in Upper Border Zone lithologies. Liquids producing augite and olivine with plagioclase follow a Ca-depletion trend until crystallization of abundant olivine and titanomagnetite drives them on a Ca-enrichment trend, to a point near Mg-free augite. Activities of silica consistent with augite-olivine pairs range from <0.6 to 0.98. The Kiglapait augite series exemplifies the crystallization of a magma occupying the narrow regime between silica saturation and undersaturation, in extreme fractionation from troctolite to Mg-free syenite.