

Petrology and Geochemistry of the Allsaw Anorthosite: a scapolitized meta-anorthosite in Grenville Province, Ontario

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The metamorphosed Allsaw Anorthosite is located within the Central Metasedimentary Belt boundary thrust zone (CMBbtz) in the Ontario Grenville Province. The Allsaw Anorthosite is a series of dismembered blocks, ranging from a ca. 14 km² main body to small blocks <1 km², and surrounded by marble breccia tectonites within the Denna Lake Structural Complex (DLSC). Geochemically, the Allsaw Anorthosite resembles other massif anorthosites from the southern Grenville: it is LREE enriched ($La_n/Yb_n = 7.7$, Total REE = 13-27 ppm) with prominent positive Eu anomalies and Norm feldspar = 76-96% (Norm An 59-71%). These new data do not support a genetic relationship with the Gooderham Syenite Belt, as had been proposed (Easton 1990, GAC Sp. Pap. 28). During the Ottawan orogeny, these bodies experienced amphibolite facies metamorphism and fluid infiltration creating a scapolite-plagioclase (\pm zoisite) assemblage. Metamorphic reactions involving scapolite and zoisite are consistent with 500-700 °C and 5-8 kbar peak metamorphism. Metamorphic hornblende (rimming and replacing cpx), F-rich phlogopite, titanite rimming opaques and rare zircon are also observed. Recrystallization within the stress field of the DLSC caused a dramatic reduction in plagioclase grain size. This recrystallization created mortar texture in some samples, where large relict crystals are surrounded by small granoblastic recrystallized grains. Scapolitization of the anorthosite and appears as veins or dikes of completely altered material. Scapolite is also disseminated throughout the body, likely due to a pervasive metasomatic fluid. Semi-quantitative EDS analysis of scapolite yields an intermediate composition (eqAn \approx 0.6) and CO₂ > S > Cl. A scapolite-rich sample is more LREE-rich than more pristine anorthosite ($La_n/Yb_n = 43$, Total REE = 177 ppm), with a smaller positive Eu anomaly. The genetic relationship between the Allsaw Anorthosite and other Grenvillian anorthosites are still unclear. Published oxygen isotopic data (Peck and Valley, CMP 2000) shows that the Allsaw Anorthosite has a high $\delta^{18}O$ (8.5 ‰) that either could relate it to the high- $\delta^{18}O$ 1.15 Ga Marcy and Morin anorthosites, but it could also be the result of infiltration of CO₂-rich fluids from surrounding marble. Further work, especially geochronology, may help resolve this issue.

Keywords: Anorthosite, Grenville, Ontario, scapolite