

Multistage corona formation in Algonquin metagabbro: unravelling the metamorphic history of Grenvillian lower crust

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The petrology, chemistry, and time of intrusion of alkaline mafic bodies in the southwest Grenville Province have been used to differentiate between autochthonous and allochthonous domains in this region. In the allochthons, the characteristic mafic suite is a group of coronitic metagabbros, the Algonquin metagabbros, which intruded at approximately 1170 Ma. Metamorphism at ca. 1060 Ma produced spectacular coronitic textures between igneous olivine and plagioclase and between igneous Fe-Ti oxides and plagioclase. This study examines in detail one metagabbro body exposed as a continuous 150 m wide outcrop in a road-cut near Emsdale, Ontario. Corona structures in this body preserve the products of multiple stages of metamorphism. Three stages of corona formation have been identified, dividing samples into three types differentiated by their mineral assemblages and textures. In Type 1 samples, which have the best preserved igneous texture, pseudomorphs after primary olivine are separated from plagioclase by coronas of orthopyroxene ± clinopyroxene, amphibole ± biotite, garnet + amphibole ± clinopyroxene ± orthopyroxene ± plagioclase symplectite. Coronas surrounding Fe-Ti oxides include amphibole + biotite and garnet + amphibole ± clinopyroxene ± orthopyroxene ± plagioclase. With increasing retrogression in Type 2 samples, relict igneous plagioclase and clinopyroxene are progressively recrystallized, mafic phases are progressively replaced by amphibole, and a sodic plagioclase moat appears between amphibole and garnet. Highly retrogressed Type 3 samples retain little to no igneous texture, with coronas largely obscured by late amphibole and plagioclase. Petrographic and electron microprobe analyses are currently underway to determine the metamorphic reactions and P-T conditions recorded in the corona products at each stage. Preliminary P-T estimates for corona assemblages in Type 1 samples, assumed to represent peak metamorphism, are ~900°C and ~13 kb, and Type 2 and Type 3 estimates are in progress. Placing constraints on the P-T conditions for the three types will reveal a P-T path of metamorphism for the metagabbro body and shed light on its metamorphic history.