Rutile and zircon LA-ICP-MS U-Pb geochronology of a corundum-bearing skarn deposit, Frenchvale, Cape Breton Island, Canada

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The Bras d'Or terrane of Cape Breton Island contains Neoproterozoic metamorphic and igneous rocks and Cambrian to Ordovician volcanic and sedimentary units, all unconformably overlain by Devonian to Carboniferous volcanic and sedimentary rocks. This study is focused on the Neoproterozoic rocks of the Boisdale Hills area, specifically the mixed carbonate-siliciclastic metamorphic rocks of the Frenchvale Road metamorphic suite, for which the age of metamorphism is poorly constrained. The Frenchvale Road metamorphic suite, for which the Neoproterozoic Shunacadie and Boisdale Hills plutons intruded. These plutons make up the largest igneous units in the Boisdale Hills. New LA-ICP-MS zircon dating shows that they are distinct units, with the Boisdale Hills pluton dated at ca. 540 Ma, slightly younger than the previously determined ca. 560 Ma age for the Shunacadie pluton. The Frenchvale Road metamorphic suite hosts several commercial marble quarries. The Frenchvale quarry that is the main subject of this study contains metasedimentary rocks including marble and calc-silicate units which are intruded by medium-grained granodiorite that is unmetamorphosed. The calc-silicate units have several distinct layers that contain large, purple to pink corundum crystals (1–5 cm), locally known as "Cape Breton rubies", in a matrix consisting of wollastonite, calcite, dolomite, and quartz with disseminated sulphide minerals. These corundum crystals have been documented in the literature but no detailed petrographic, geochemical, or geochronological work have been done on them.

Rutile is present in several different zones within the samples, with crystals found in the wollastonite-calcite matrix, within coronas of micas around the corundum crystals, and within the outer zones of larger corundum crystals. U-Pb geochronology on the rutile grains will determine whether they formed during one episode of metamorphism, or whether the rutile crystals in different mineralogical contexts represent different generations of growth. The primary igneous rutile and titanite crystals occurring within the granodiorite that intrudes the calcsilicate rocks will also be compared to the metamorphic ones. U-Pb (zircon) ages from granodiorite in the quarry indicate that it was emplaced at ca. 560 Ma, and therefore is interpreted to be part of the Shunacadie pluton. Preliminary rutile ages from reconnaissance analyses indicate that some of the rutile crystals are ca. 560 Ma, representing either new mineral growth during contact metamorphism, or resetting of the ages of older rutile grains during contact metamorphism. Further geochronology work and trace element analysis by LA-ICP-MS will be undertaken to distinguish between these two hypotheses.

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