Origin of garnet in the Liscomb Complex, north-central Meguma terrane, Nova Scotia

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The Liscomb Complex, north-central Meguma terrane, consists mainly of ca. 373 Ma granitoid rocks with subordinate metasedimentary rocks. Detailed bedrock mapping in the 2008 field season, combined with aeromagnetic maps, showed that the metasedimentary rocks are correlative with formations mapped elsewhere in the Goldenville and Halifax groups of the Meguma terrane, in particular the distinctive manganiferous coticule-bearing Beaverbank Formation, the uppermost unit of the Goldenville Group. Garnet, up to 3 cm in diameter, is abundant in contact-metamorphosed Beaverbank Formation and its enclaves in the granitoid rocks, as well as in the granitoid rocks themselves. The purpose of this project is to investigate the origin of garnet in the granitoid rocks of the Liscomb Complex, in particular the relationship of the garnet to magma contamination by the Mn-rich country rocks of the Beaverbank Formation.

Based on petrographic examination of garnet shape and texture, combined with preliminary results of analyses by electron microprobe, four different types of garnet have been tentatively identified. Garnet of type 1 occurs in both metasedimentary and granitoid rocks, and contains inclusions of country rock minerals (quartz, biotite, and plagioclase). Type 1 garnet is subhedral to euhedral, has moderate Mn content (8–14 wt.% MnO), and is zoned, with higher Mn cores and lower Mn rims. This garnet is of inferred regional metamorphic origin, and hence in granitoid samples is of xenocrystic origin. Larger type 1 garnet crystals may have formed by coalescence of smaller type 1 garnet grains as a result of energy constraints

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during metamorphism. Garnet of type 2 is similar to type 1 in shape, inclusion mineralogy, and compositional zoning but has higher Mn (~19–28 wt.% MnO), and occurs mostly in metasedimentary samples but possibly in some granitoid samples. Type 2 garnet is interpreted to be of contact metamorphic origin. Garnet of type 3 occurs only in granitoid samples. It is typically euhedral and has zoning similar to that of contact metamorphic type 2 garnet grains but with lower Mn (~8–16 wt.% MnO). It contains abundant inclusions of quartz, plagioclase, apatite, biotite, and ilmenite, and is of inferred peritectic origin, meaning that it crystallized from partially melted manganiferous country rock. Garnet of type 4 is euhedral and low in Mn (2–5 wt.% MnO). It is zoned, with lower Mn core to a higher Mn rim, and contains inclusions of igneous minerals (plagioclase laths, elongate apatite). Type 4 garnet occurs only in tonalitic granitoid samples and is interpreted to be of primary magmatic origin. The preliminary results of this study suggest that contamination by the manganiferous Beaverbank Formation was a major factor in producing the unusually garnet-rich granitoid rocks of the Liscomb Complex.