Geochemical comparison of the Mount Douglas granite and the oldest phase of the Mount Pleasant granophile deposit system

NADIA MOHAMMADI[1*], DAVID R. LENTZ[2], KATHLEEN G. THORNE[3] AND CHRISTOPHER R. M. MCFARLANE[4]

[124]Department of Earth Science, University of New Brunswick, Fredericton, NB, E3B 5A3, Canada
nadia.mohammadi@unb.ca[1*]dlentz@unb.ca[2], crmm@unb.ca[4]
[3]Geological Surveys (South), New Brunswick Department of Energy and Mines, Fredericton, NB, E3B 5H1, Canada
Kay.Thorne@gnb.ca[3]

The Mount Douglas leucogranite (MD), located in southwestern New Brunswick, forms the eastern part of the Saint George Batholith, and is interpreted to represent the subvolcanic portion of the Mount Pleasant W-Mo-Bi and Sn-Zn-Cu-In deposits (MP). Previous studies subdivided the MD and MP plutons into different mappable units. For this study, the youngest phases of the MD (Dmd2 and Dmd3) and the oldest phases of the MP (Granite I and II) have been compared to demonstrate potential co-magmatic genesis and source of mineralization. Fine to medium-grained Dmd2 and Dmd3 granites with porphyritic and equigranular texture comprises the majority of the MD, and are mainly associated with Sn-W-Mo mineralization. Fine-grained equigranular MP Granite I (GI) is mostly associated with the W-Mo-Bi mineralization, whereas aplitic to porphyritic MP Granite II (GII) is mainly associated with Sn-Cu-Zn-In mineralization. The Dmd2 and Dmd3 show a flat "birdwing-shape" REE pattern characterized by large negative Eu anomalies (Eu/Eu*=0.021–0.43) and the low $(La/Yb)_N$ ratios (1.7-9.3). Low K/Rb (average 102.7) and Nb/Ta (≤ 6.8), but normal Zr/Hf (≤ 37.5) ratios possibly reflect significant involvement of low-T crystal fractionation. However, the GI and GII show flat "birdwing-shape" REE patterns with larger negative Eu anomalies (Eu/Eu*=0.014–0.005), and lower $(La/Yb)_N$ (1.1-1.7), Nb/Ta (≤ 6.6), and Zr/Hf (≤ 21.7) ratios reflecting an origin consistent with extreme low T fractionation; these HFSE ratio data are consistent with the major- and trace-element data. Besides similarities of the Dmd2 and Dmd3 with GI and GII in terms of texture and mineralization, new geochronology shows that they have approximately the same age (new U-Pb monazite date of 366 ± 2 Ma of Dmd2 and 370.1 ± 3.4 Ma of Dmd3, and new Re-Os molybdenite date of 369.7±1.6 Ma and 370.1±1.7 Ma of Granite I); on the other hand, progressive differentiation from Dmd2 → Dmd3 → GI → GII during magmatic evolution may suggest a single genetic group for the MD and MP granites.