A preliminary multi-element pXRF analysis of alteration and mineralization in the various felsic rocks of the polymetallic North Zone deposit area, Mount Pleasant, New Brunswick, Canada

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The Mount Pleasant deposits, located in southwestern New Brunswick, are part of a late Devonian sub-volcanic eruptive complex that intrudes into the western margin of the associated caldera; granitic intrusions are the McDougall Brook and Mount Pleasant granite suites. Mount Pleasant is divided into two zones, the North Zone dominantly Sn-Cu-Zn-In with local W-Mo and the Fire Tower Zone W-Mo-Bi deposits, with a Zn-In lode-breccia zone. A multielement pXRF study (X5000) of the surface samples (34) from the North Zone was conducted. The Ti, Th, Nb, Zr, Y, and related Ti ratios, i.e., Th/Ti, helped identify three groups of variably altered felsic host rocks; these elements are typically interpreted as immobile, although that has not been ascertained here yet. Based on correlations with Inverno's work from 2006 and mapping in the region, they are the Little Mount Pleasant Formation (LMP) (tuff) (21), McDougall Brook porphyry/granite (MBG) (volcanic to subvolcanic) (11), and possibly Granite I or II (2) that is associated with each of the deposit systems. Further analysis of the dataset using mobile elements (pXRF data) is utilized to describe the alteration and associated mineralization and characterize it with respect to the three units identified (spatial analysis). Chlorite and sericite are associated with alteration of all units, but chloritization and sulphidation dominates at higher degrees of alteration. The high acidic conditions along with the high activity of Fe stabilized chlorite are related to sericitic alteration. Sericitization begins with the destruction of feldspars in the host rock to form sericite and biotite seems to be slightly chloritized, although it is hard to observe depending on the degree of overprinting by younger alteration assemblages. Chloritization in the rocks locally seems to be accompanied with quartz and (or) fluorite. The dominant ore minerals associated with chloritization are Fe-rich sphalerite and arsenopyrite. The amounts of Fe present reflect pyrite, magnetite, and (or) chlorite abundance, whereas chloritization gives high amounts of Fe, Mn, and Mg in the rocks. Because chloritization and sulphidation dominates and higher degrees of alteration, Fe increases and K decreases; therefore Fe/K increases from weakly to intensely altered and mineralized rocks. Fe correlates poorly with K (r' = -0.05), but shows that Granite I-II is probably less affected by sericitization than LMP and MBG. A plot of Fe/K vs. Ca (r' = 0.26) indicates fluorite alteration in greisen and chlorite zones. Fe/K vs. S shows a positive correlation (r' = 0.42) related to sulphidization associated with chlorite. W correlates with Fe/K (r' = 0.48), Bi correlates with Fe/K (r' = 0.37), Sn correlates with Fe/K (r' = 0.49), Mo correlates with Fe/K (0.35), and Cu correlates with Fe/K (r' = 0.30).

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