Portable X-ray fluorescence analysis of terminal grade in basal till south of the Mount Pleasant deposit, New Brunswick, Canada*

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A common practice for drift exploration surveys is to collect the <63 μm grain-size fraction of basal till for chemical analysis by ICP-MS and INAA. Recent technical advances have enabled researchers to employ portable X-ray fluorescence (pXRF) as a rapid and economical method of chemical analysis with certain limitations that are now being widely studied.

For the present preliminary study, 80 samples of basal till were collected within the McDougall Lake area (NTS: 21 G/07), south of Mount Pleasant: a past-producing W mine in southwestern N.B. Other occurrences of mineralization are known also to be present in the area. Much of the study area is underlain by granite, which at many locations has been intensely weathered to sandy, angular "grus" and incorporated into the locally derived till cover. The high proportion of coarse material within the till matrix is a concern for analytical methods which commonly employ acid digestion on the <63 μm grain-size fraction only. Thus, pXRF has been employed to analyze and compare concentrations of selected elements among the <-1 Φ (very coarse sand, <2 mm), <2 Φ (fine sand, <0.25 mm) and <4 Φ (coarse silt and clay, <63 μm) matrix modes. The analysis of separate matrix modes has enabled assessment of mineral comminution to "terminal grades" and the effect that terminal grades have on drift prospecting efficacy.

For most elements analyzed, the <63 μm matrix mode reported the highest average concentrations. However, regardless of matrix mode analyzed, elements Pb, S, As, Zn, and Ce, in descending magnitude, consistently demonstrated a large separation between the average and peak concentrations, indicating their utility as pathfinder elements for this mineralized area. For Pb, the magnitude between average and peak values in the size fractions analyzed was 11.76 times greater for <-1 Φ, 12.62 times greater for <2 Φ and 19.60 times greater for <4 Φ.

The results suggest that comminution to terminal grade sizes was not fully achieved for several minerals. Although greater geochemical contrast can often be attained by analyzing the <4 Φ matrix mode, it is proposed that analysis of the <2 Φ and <-1 Φ matrix modes could also yield useful information for drift prospecting in areas of grusrich till.

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