Mineralogical reaction modelling of partial extractions in mineral exploration samples.

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Geochemical exploration using partial extractions, targeting specific phases in soil samples for analysis, allows for detection of nuanced signals from mineralization under exotic cover. These deposits make up a large portion of mineral resources in areas that have experienced recent glaciation, such as Canada and northern USA. Interpretation of partial extraction data is challenging due to the uncertainty of targeted phases under various extraction conditions. To better constrain the effects of these extractions, multi-staged mineralogical and chemical analysis of the samples and the processes themselves are required. Samples collected from kimberlites in the NWT, Canada and copper-porphyry deposits from BC present an opportunity to observe the effects of partial extraction geochemistry across multiple deposit types. Mineralogical and chemical characterization of these anomalous samples have been completed using XRD, synchrotron XANES, and SEM methods to generate trace metal deportment models. These samples have been subjected to a variety of commercial partial extraction techniques followed by re-characterisation post extraction to determine the phase changes and re-distribution of the chemistry. Experimental set up allowed for continuous pH, Eh and chemistry changes to be monitored during the extraction. The evolution of these parameters creates conditions that influence sorption and mineral precipitation within the sample. The leachate was analysed using ICP-MS allowing for a chemical mass balance and the creation of reaction models for the extractions. Results from the research will lead to improvements in the analytical methodology.