

Electron Microprobe Analysis of Indicator Minerals in Alberta

The Alberta Geological Survey (AGS) commissioned an electron microprobe analysis (EMPA) of indicator mineral grains. The dataset includes the geochemical composition of 4635 indicator mineral grains picked from over 380 stream and glacial sediment samples collected from various locations across the province during past and current AGS projects. The data from the analysis will be available for download from the AGS website.

Electron microprobe analysis is a technique that uses specialized instruments to focus a beam of electrons on a mineral sample. The electron beam ionizes the atoms in the sample, causing them to emit electrons and X-rays corresponding to specific elements in the sample. The X-rays are used to identify the type and concentration of elements within a sample.

The geochemistry of indicator mineral grains helps researchers to determine the type of mineral system in which these grains were formed and how they have been altered over time. Indicator minerals include ore, accessory, and alteration minerals characteristic of certain mineral deposit types. Indicator minerals can be classified as kimberlite indicator minerals (KIMs), magmatic/metamorphosed massive sulphide indicator minerals (MMSIMs®*), or rare earth element (REE)-bearing minerals, depending on their composition and source. Indicator minerals are included in sediments as glaciers or streams erode the bedrock. Studying the distribution of specific indicator minerals in sediments helps pinpoint the location of bedrock mineral deposits, such as kimberlite pipes.

Previous EMPA projects at the AGS focused on KIMs; however, by including MMSIMs and REE-bearing minerals in this study, we can investigate the potential for a wider array of critical mineral deposits in Alberta.

Highlights

Studying the distribution of specific indicator minerals in sediments helps pinpoint the location of bedrock mineral deposits, such as kimberlite.

Kimberlite indicator minerals may indicate the presence of kimberlites, which are igneous rocks that form deep within the Earth's mantle and have the potential to host diamonds.



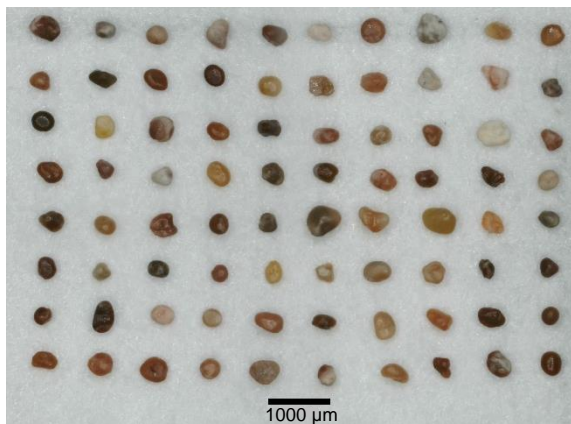
Magmatic/metamorphosed massive sulphide indicator minerals are heavy, coarse-grained minerals resistant to weathering. These minerals tend to be enriched in magnesium, manganese, aluminium, and chromium and can indicate the presence of base metal deposits.



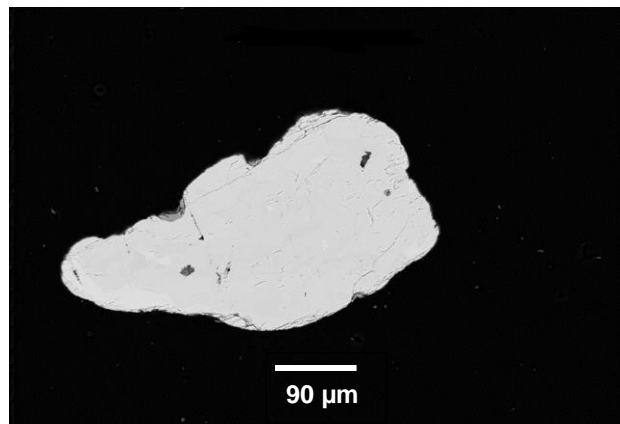
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*MMSIM is a registered trademark of Overburden Drilling Management (ODM) Limited, Nepean, Ontario.

This dataset includes the geochemical composition of 3000 indicator mineral grains picked from over 265 stream and glacial sediment samples collected from various locations across the province.



Florencite and monazite grains mounted for microprobe analysis.

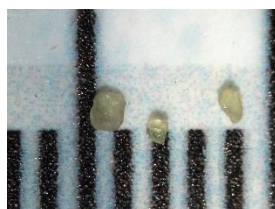


Electron microprobe image of a monazite grain, annotated with the spot location where the data was collected.

Kimberlite Indicator Mineral Grain Types Examples



Peridotitic garnet



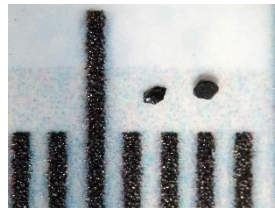
Forsterite



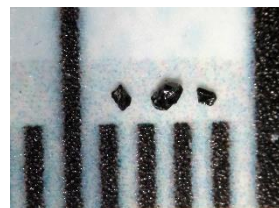
Orange mantle garnet



Chromium-rich diopside



Chromite



Ilmenite