

Mining for Success: Applications of powder X-ray diffraction to mineral exploration and mineral processing

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World-wide, there is a critical demand for strategic elements (Ni, Co, Li) and with this comes an even greater need to explore, discover and mine new sources of these elements. While science has experienced an explosion of new analytical techniques suited to the pursuit of the discovery of new mineral sources and their subsequent beneficiation, powder X-ray diffraction (PXRD) continues to be an age-tested, elegant tool directly applicable to these endeavors. This presentation will highlight a few of the essential, value-added ways in which PXRD, combined with Rietveld refinement, has been applied to the exploration and processing of magmatic Ni-Cu-PGE ores, specifically focussing on: (1) development of tools useful in the quantification of pyrrhotite polytypes; (2) evaluation of Ni-Cu mineralization and ore grades; (3) recognition of fertile, ore-bearing environments and (4) characterization of new precious-metal minerals. Along with these, the use of PXRD as a tool to better understand and characterize non-traditional ores (e.g., curling stones!) will also be presented. The key outcome(s) will be an enhanced appreciation of how traditional PXRD, coupled with Rietveld refinement, and can be successfully applied to solving modern-day problems associated with mineral exploration and mining.