

Influence of hydrothermal fluids on PGE mineralization in the River Valley Intrusion, Ontario, Canada

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The River Valley Intrusion (RVI) is a ~2.48 Ga gabbroic intrusion that is part of the East Bull Lake Intrusive suite within the Grenville Front tectonic zone. The RVI hosts contact-style Cu-PGE mineralization in a marginal breccia zone and in stratigraphically overlying massive to layered gabbros.

The gabbros that host the mineralization have been altered and deformed, although the latter is restricted to mainly the SE part of the intrusion. Alteration is extensive and generally comprises pervasive, patchy, and fracture/vein-related replacement of clinopyroxene ± plagioclase by amphibole ± chlorite ± epidote. K-feldspar alteration is also common but more localized. Biotite and garnet also form part of the alteration assemblage in the SE part of the intrusion.

Sulphides in the RVI comprise, in decreasing order of abundance, chalcopyrite, pyrrhotite, pyrite and pentlandite. Interstitial, magmatic sulphides are present, however, most sulphides are associated or intergrown with alteration minerals or in veins with alteration halos. Mineralized samples ($\text{Pd}+\text{Pt}+\text{Au} = 1.3\text{--}23.9 \text{ ppm}$) may or may not contain sulphides and contain a variety of platinum group minerals (PGM). Kotulskite (PdTe) and sperrylite (PtAs_2) are the most abundant PGM, but vincentite ($(\text{Pd},\text{Pt})_3(\text{As},\text{Sb},\text{Te})$), mertieite I ($\text{Pd}_{11}(\text{Sb},\text{As})_4$) or mertieite II ($\text{Pd}_8(\text{Sb},\text{As})_3$), braggite ($(\text{Pt},\text{Pd})\text{S}$), and moncheite (PtTe_2) are also present. The majority of PGM are located in silicates, principally amphibole, with fewer in plagioclase, K-feldspar and quartz. PGM are also hosted by magmatic sulphides (chalcopyrite, pyrrhotite and pentlandite). Moncheite and braggite have only been found in magmatic sulphides.

Although PGM are present in sulphides that are likely magmatic, most PGM are associated with alteration silicates, and rocks with high PGE concentrations are invariably altered, indicating that fluids have redistributed PGE near the margins of the RVI.

Andesites as mixtures of crystals and evolved melts derived from multi-component crustal and mantle sources: Evidence from Ruapehu, New Zealand

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Andesites erupted from Ruapehu Volcano at the southern end of the Taupo Volcanic Zone (TVZ) in New Zealand's North Island, are mixtures of crystals and melts formed through polybaric processes and derived from both crustal and mantle sources. Trends on Sr and Nd isotopic diagrams can be approximated by simple assimilation fractional crystallisation (AFC) models involving bulk assimilation of basement crustal compositions but these models are inadequate for a wide range of trace elements. The complete spectrum of andesitic and dacitic compositions can best be modelled by AFC processes involving a range of parental basaltic andesites and variable combinations of crystals and melt derived by partial anatexis of lower or mid-crustal rocks. With time the mix of processes and the level at which they have taken place has changed as the magmatic system has evolved thermally and compositionally.

Only one basaltic flow has been identified on Ruapehu and along with basaltic andesites of the oldest flow unit on the volcano, it is distinctly more depleted in Zr and REE and has a more radiogenic $^{87}\text{Sr}/^{86}\text{Sr}$ isotopic composition than other TVZ basalts and andesites, including the vast majority from Ruapehu. This suggests that either the parental, mantle-derived component or the crustal component involved in AFC processes has changed with time. Ruapehu basaltic andesites are relatively depleted in K, Rb, Zr, and REE the scope for extensive AFC involving anything other than a highly depleted crustal component is limited.