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Petrological investigation of Merensky Reef Unit lithologies at Two Rivers Platinum Mine and comparison to stratigraphically similar rocks north of the Steelpoort fault, eastern Bushveld Complex, South Africa

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This research study focuses on the enigmatic occurrence of noritic lenses (termed "brown sugar norite" by mine geologists, here after referred to as BSN), within the feldspathic pyroxenite of the Merensky Reef (MR) at Two Rivers Platinum Mine which is situated on the southern sector of the eastern limb of the Bushveld Complex. The cumulate rocks associated with the MR unit are characterised by the use of geochemistry and mineralogy and compared to stratigraphically similar rock types north of the Steelpoort fault at Eerste Geluk. The BSN are fine-grained and appear to only occur where the upper chromite stringer of the MR unit is present. Orthopyroxene is the dominant cumulate phase in both the BSN and feldspathic pyroxenite followed by interstitial plagioclase. Clinopyroxene occurs mostly as exsolved lamellae phase within orthopyroxene and intermittent rims around orthopyroxene which could be attributed to a decrease in temperature and compositional change of the melt. Textural features of the different rock types suggest recrystallization of minerals and disequilibrium of magma. At Eerste Geluk BSN is absent, minerals of the Merensky lithologies display more alteration or deformation and a higher concentration of hydrous minerals. Eerste Geluk's close proximity to the Steelpoort fault makes it plausible for dynamic magmatic processes to have been active (Cawthorn et al., 2002) resulting in the alteration of minerals. Strontium isotope analyses of five representative samples of the Merensky interval at TRP yielded 87Sr/86Sr typical of Critical Zone Magma. The BSN has a lower 87Sr/86Sr ratio relative to pyroxenite. PGMs occur associated with base metal sulphides (BMS), silicates and chromite (Kinloch, 1982). Results show that pentlandite contains a higher concentration of PGEs relative to pyrrhotite and chalcopyrite. Pd is the most dominant PGE present in BMS analysed with concentrations ranging between 0.5 to 428 ppm.

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