

Ni-Cu-PGM Mineralisation in the Bastard Reef and Merensky Reef of the Flatreef section, Turfspruit Farm, Northern Limb, Bushveld Igneous Complex, South Africa.

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The Bushveld Igneous Complex of South Africa is the largest layered igneous complex in the world and it is the current leading producer of platinum group metals globally. The Northern Limb is the northern extension of the complex currently mined (open pit) for a Ni-Cu-PGM rich deposit hosted in a lithologically variable igneous sequence dipping at about 45 degrees and has been intensively affected by contamination and alteration termed the Platreef (Kinnaid et al, 2005). Westwards of the Platreef lies the Flatreef section, which is a recently discovered sub-horizontal down-dip extension of the Platreef. It hosts the Ni-Cu-PGM rich deposit in two successive high-grade reefs termed the Bastard Reef and the Merensky Reef that are amenable for underground mining methods (Grobler et al, 2018). The Flatreef has not been studied in detail and this study reports on the petrographical and semi-quantitative investigations done on the mineralized reefs.

Logging and petrographical investigations revealed the Bastard Reef to comprise a fine to medium-grained equigranular feldspathic orthopyroxenite. Several metres below the Bastard Reef lies the Merensky Reef, which has been subdivided into 3 different units (M2, M1U and M1L) mainly based on mineralogical and textural variations. The M2 is the uppermost layer comprising medium to coarse-grained equigranular orthopyroxenite, denoted by cumulus orthopyroxene and is bound irregularly by a chromite seam at its top contact. The M2 orthopyroxenite is underlain by the M1U denoted by a cumulate textured pegmatoidal orthopyroxenite and is commonly bound by a chromite stringer at its top contact and a less consistent one at its base. The M1L, which is laterally less continuous, comprises a poikilitic textured harzburgite and/or varied-textured olivine-bearing orthopyroxenite. SEM analysis revealed sulphide mineral assemblages in the reefs usually comprising pyrrhotite, pentlandite and chalcopyrite as fine to medium-grained disseminations, blebs and net-textured sulphides. PGM mineralisation comprise a wide range of PGMs, mostly Platinum and Palladium dominated, grouped into bismuthotellurides (-Bi-Te), antimonides, arsenides, Fe and Sn alloys, sulphides, as well as laurite (RuS₂) and Ir-Ru-Rh-Pt-Pd sulfoarsenides alongside chromite seams. Semi-quantitative analysis illustrates the Flatreef section to be an undisturbed magmatic sequence that is much less affected by assimilation and contamination. It retains much of its magmatic characteristics and provides a great opportunity to furthermore study magmatic processes that resulted in the formation of such an enigmatic deposit.

References

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