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NORMAL REEF SUBFACIES OF THE MERENSKY REEF AT NORTHAM PLATINUM MINE, ZWARTKLIP FACIES, WESTERN BUSHVELD COMPLEX, SOUTH AFRICA

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ABSTRACT

The Normal Reef Subfacies of the Swartklip facies of the Merensky Reef along the western limb of the Rustenburg Layered Suite, exposed on Northam Platinum mine, displays lateral and vertical variations in its inter-chromitite lithologies, content in platinum-group elements and grade, and the mode of sulfide occurrence. Reef greater than 300 cm in thickness consists of a footwall of mottled anorthosite, overlain by a granular orthocumulate chromitite layer (the lower chromitite of the reef), followed by a pegmatitic feldspathic dunite, a 5- to 10-cm-thick massive, plagioclase-poor dunite, a heterogeneous pegmatitic harzburgite, succeeded by a coarse-grained pegmatitic pyroxenite, collectively comprising a pre-Merensky cyclic unit. The upper pegmatitic pyroxenite is in turn overlain by the granular (upper) chromitite of the reef, occurring at the base of the Merensky Cyclic Unit, which is overlain by a homogeneous poikilitic orthopyroxenite. Disseminated and clustered pentlandite, pyrrhotite and chalcopyrite occur throughout the inter-chromitite pegmatite, but are not observed in the massive, plagioclase-poor dunite, which typically occurs approximately 100 cm above the lower chromitite. Thermal recrystallization and downward migration of a reconstitution front and mechanical erosion of the medium-grained heterogeneous pegmatitic harzburgite accompanied progressive thinning of the reef from an inter-chromitite reef greater than 300 cm in thickness. Breaching of the massive, relatively impermeable layer of massive dunite resulted in pronounced or accelerated thermomechanical erosion of the underlying pegmatitic dunite. Peaks in platinum-group-element content, situated just below the upper chromitite and just above the lower chromitite, merge with reef thinning, becoming indistinct in reef that is less than 160 cm thick. With further thinning, until the point where the two chromitites are juxtaposed or merged, the single peak in PGE content "migrates" into the poikilitic orthopyroxenite hanging-wall. A sulfide lag, consisting of up to 20% sulfide by volume, occurs in reef less than 160 cm in thickness. Its presence is especially evident near the point where the Regional Pothole subfacies becomes manifest, and the upper chromitite or base of the Merensky Cyclic Unit transgresses the lower chromitite. Spatial distributions and graphical correlations of sampling data, related to reef thickness, indicate that there is a strong positive correlation between ΣPGE grams in the total reef sampled and the inter-reef pegmatite. A strong inverse relationship, relative to thinning, is observed between ΣPGE reef grade and ΣPGE grams. The ΣPGE grams content of the upper or Merensky chromitite of the reef is remarkably consistent over the extent of Normal Reef of the Merensky cyclic unit exposed at Northam, indicating that it is a drape or post-erosional crystal cumulate over an eroded and recrystallized pre-Merensky cyclic unit.

Keywords: Merensky Reef, platinum-group elements, sulfides, thermomechanical erosion, Northam Platinum mine, Bushveld Complex, South Africa.

SOMMAIRE

Le sous-faciès considéré "Banc normal" du faciès de Swartklip du banc de Merensky, le long de la séquence occidentale de la suite stratifiée de Rustenburg, telle qu'elle affleure à la mine Northam Platinum, fait preuve de variations latérales et verticales en types de roche intercalée entre le deux horizons de chromitite, en contenu et en teneurs en éléments du groupe du platine (EGP), et en aspects des sulfures présents. Où il est supérieur à 300 cm, le banc possède une base d'anorthosite mouchetée, que recouvre un niveau orthocumulatif de chromitite granulaire (la chromitite inférieure du banc) et, successivement, une dunite feldspathique pegmatitique, une dunite massive de 5 à 10 cm en épaisseur et à faible teneur en plagioclase, une harzburgite hétérogène pegmatitique, et ensuite une pyroxénite pegmatitique, le tout définissant une unité cyclique pre-Merensky. Vient ensuite la chromitite granulaire supérieure du banc, définissant la base de l'unité cyclique de Merensky, qui est recouverte d'une orthopyroxénite poecilitique homogène. Des grains de pentlandite, pyrrhotite et chalcopyrite sont disséminés ou regroupés partout

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