

## **Exploring north: New types of PGE deposits in the Bushveld Complex**

Marina A. Yudovskaya\*, Judith A. Kinnaird, Florian Huthmann, Matthew McCreesh, Danie F. Grobler, Thys J. Botha

\*University of Witwatersrand, Johannesburg, South Africa, Email:  
marina.yudovskaya@wits.ac.za

The renowned Bushveld reefs are laterally persistent thin layers that are extremely enriched in PGE with respect to underlying and overlying rocks. The PGE reefs have a relatively low sulfide content <5% and are sandwiched between cumulate rocks that are much poorer in S. However, there is evidence that the barren S-free silicate framework still bears the combined PGE resources several times greater than the PGE budget of the low-sulfide reefs (Naldrett et al., 2011). An absence of a concentration mechanism such as scavenging by sulphide liquid left these resources dissipated and unrecoverable. A key question in the concept of magmatic origin of the reefs is how S-poor Bushveld magmas achieved saturation in sulfide at the discrete levels within the Critical Zone, which exclusively hosts all the mineable PGE deposits of the western and eastern limbs.

The problem of S shortage does not exist for the northern limb where availability of sedimentary S from the Transvaal footwall promotes diverse types of Cu-Ni-PGE mineralization on the different stratigraphic levels. The occurrence of PGE deposits within the Lower Zone ultramafic cumulates in the northern limb indicates that even primitive unfractionated Bushveld melts are capable of concentrating PGE given the presence of sufficient crustal S. The marginal style PGE-rich mineralization occurs as disseminated and massive sulfide orebodies in Platreef hybrid and contact-metamorphic rocks and is controlled by the setting at the edge of the chamber. The recent exploration projects on Akanani and Turfspruit revealed that in a favorable structural setting and with an increasing depth the Platreef sequence transgresses into a more typical Critical Zone sequence with persistent PGE reefs at the top. The stratigraphic position, compositions of rocks and minerals of these reefs resemble those of the Merensky Reef, however, the average thickness of a Platreef reef is much higher (~24 m) likely due to a higher amount of sulfide liquid generated. The very recent discovery of the Waterberg F and T mineralized zones in a separate sub-basin north of the Hout River Shear Zone gave evidence that under specific conditions both ultramafic intrusions and gabbroic sequences derivative of the Main or Upper zone melts may host significant PGE low-sulfide mineralization (Kinnaird et al., in press). All described PGE deposits occurs close to the basal contact of the Complex regardless of the variable stratigraphic position and compositions of their host intrusions, with emplacement controlled mostly by pre-existing structure and floor topography. All these discoveries open new horizons for the further exploration of these promising types of high-tonnage ores.