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Results of a high resolution mineralogical and geochemical study within the Merensky reef, Western Limb, Bushveld complex

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A study of the Merensky reef, in the south-western portion of the Western Limb of the Bushveld complex, was undertaken. The mineralogy and geochemistry of core sections across both reef types (pegmatoidal and non-pegmatoidal) from the area will be described. It will be shown that variation occur across the thickness of the Merensky reef in both reef types.

The cores were analysed in 2 cm intervals. After optical investigation, quantitative mineral analyses were done using electron microscopy in both scanning and static modes. Whole rock major elements were determined by using X-ray fluorescence and trace elements by using inductively coupled plasma mass spectrometry (ICP-MS). The platinum-group elements (PGE) were determined by Ni-S fire assay with an ICP-MS finish, and sulphur by Infrared analysis.

Microscope analysis showed sulphide inclusions visible in chromite grains. Some of these inclusions display negative crystal shapes imposed by the crystal structure of the host chromite. Similar trapped sulphide inclusions have been described from chromites in the Platreef [1]. This type of sulphide inclusion in chromite grains could indicate that sulphide liquid may have been present in the system at a very early stage.

The mineral chemistry of chromite shows that there is a close correlation between the single chromitite stringer in the non-pegmatoidal reef and the top chromitite stringer in the pegmatoidal reef, but for the other major element chemistry there is a better correlation between the single chromitite stringer in the non-pegmatoidal reef and the bottom chromitite stringer in the pegmatoidal reef. The two chromitite stringers of the pegmatoidal reef are significantly different. This is in contrast to the findings from similar work done recently by Cawthorn and Wansbury [2].

Results indicate that there is a close relationship between Cr concentration and PGE enrichment. In the non-pegmatoidal Merensky reef, the highest whole rock PGE content is associated with the chromitite stringer. In the case of the pegmatoidal reef, the highest PGE content is found with the upper chromitite stringer and the pegmatoidal layer. As is typical of the Merensky reef, Pt and Pd are the dominant PGE with higher Pt than Pd [3]. Some very high Pt/Pd ratios (up to 8.2) were observed, which have not been reported elsewhere in the Western Limb.

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References:

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