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Vanadium, Iron, Titanium and Phosphate mineralisation in the Upper Zone of the Northern Limb of the Bushveld Complex

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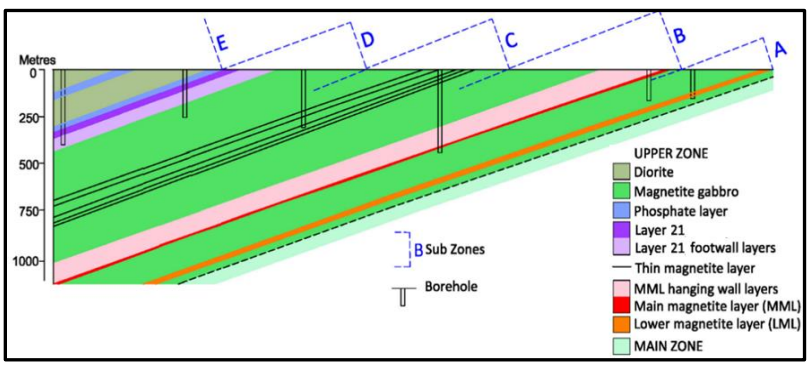
As in the eastern and western limbs of the Bushveld Complex, V, Fe, Ti and P mineralisation is also present in the Upper Zone of the Northern Limb. V, Fe and Ti mineralisation is intimately associated with magnetite which occurs as concordant, massive and disseminated magnetitite layers within gabbro and often closely associated with anorthosite layers. Magnetitite layers have been divided into sub zones A to E (Figure 1). The important vanadium-rich Main Magnetite Layer (MML) (Figure 2) lies at the base of subzone B. It is underlain by footwall layers in sub zone A which contain generally disseminated but higher V_2O_5 tenor in magnetite. The MML and footwall layers are the main layers mined at various localities in the Eastern and western Limbs of the Bushveld. Numerous MML hanging wall layers also contain significant V values.



V grades in magnetite decline upwards within layered units from the base to the top of the Upper Zone while Ti content increases on average from 5% to 18% through sub zones A to E. The most robust magnetite layer is found at the top of sub zone D and is equated with layer 21 elsewhere in the Bushveld.

Figure 1: Generalised section through the Upper Zone in the Northern Limb

It consists of massive, stringer and disseminated magnetite over a thickness of ± 45m (Figure 3). The TiO_2 content ranges from 18% to 22%, with a V_2O_5 content ranging from 0.1% to 0.3% and with an Fe content of 30% to 42%. It represents a potentially huge resource of Fe and Ti.

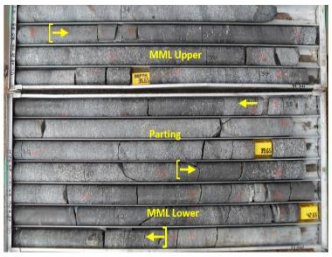


Figure 2

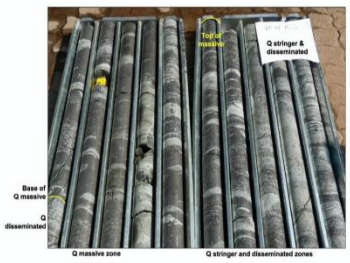


Figure 3

Phosphate in the form of apatite within an apatite-bearing diorite defines the base of the Subzone E (Figure 1). A lower layer averages over 4% P_2O_5 over 30m. A similar layer, higher in the stratigraphy, also has similar P_2O_5 grades. These layers

represent a huge potential resource of Phosphate.

Figure 2: MML with gabbro parting containing disseminated magnetite and Figure 3: massive, stringer and disseminated magnetite mineralisation of layer 21.

Detailed geochemical variation trends for a range of elements for the MML and layer 21 and their associated minor hanging and footwall layers, are discussed. Of significance is the continuity of the major as well as minor magnetite layers over many kilometres.