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Mineralisation in the Bushveld Complex

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The Bushveld Complex, situated on the Kaapvaal Craton of South Africa is the world's greatest layered igneous intrusion and hosts the largest deposits of chromium, Platinum Group Elements (PGE'S) and vanadium ore known (Fig.1). It also hosts significant deposits of tin and fluorspar. An overview of the nature of these deposits is presented.



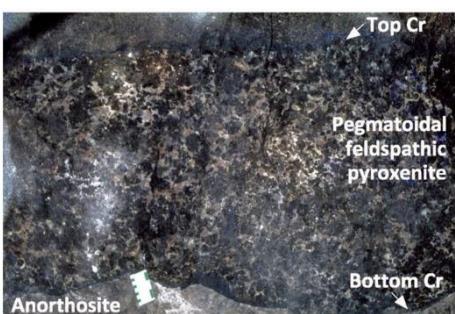
The geological setting of the 5 major components of the Bushveld Complex in the Western, Eastern and Northern limbs is outlined. Chromite and PGE -enriched layers are confined to the Critical Zone where layers of chromitite generally occur at the base of pyroxenite units (Fig 2). The chromium content and Cr/Fe ratios of the chromitite layers increases from the base to the top of the Critical Zone. PGE'S are present in all of the chromitite layers with a general increase from less than 0.5 ppm at the base to 7ppm in the uppermost economic UG2 layer. The uppermost pyroxenitic (often pegmatoidal) and prime PGE-bearing layer, the Merensky Reef is bound by two chromitite stringers (Fig.3) of which the top stringer can transgress downward into "pothole structure". The Merensky Reef is interpreted as representing a regional unconformity at the base of a pyroxenite unit which thermo-chemically reacted with, eroded and mineralised its immediate footwall.

Figure 1: Layers of resistant, dark, pyroxenite with less resistant harzburgite layers of the Lower Zone of the Bushveld Complex which exemplify the layering in the complex.



Vanadium-bearing titaniferous magnetite layers are confined to the Upper Zone with significant phosphate mineralisation occurring towards the top of the latter. Economic vanadium concentrations are present in the lowermost layers including the Main Magnetite Layer with V_2O_5 values in magnetite ranging from greater than 2% to 1.6% in the latter. The steady decrease in the amounts of vanadium from the lowermost to the topmost layers, is accompanied by a systematic increase in titanium content.

Figure 2. Layers of Chromitite, pyroxenite anorthosite and norite in the middle of the Critical Zone.



Important tin and fluorspar mineralisation is related to areas of fractionation of the overlying Bushveld granite. Endogenic concentration takes place in high grade pipes and as

dissemination in cupola structures at the top of the uppermost granitic sheets. Exogenic concentration takes places along tensional features such as joints, fractures and along bedding planes in overlying sedimentary and felsic volcanic assemblages.

Figure 3. "Normal" Merensky Reef of the Western Limb consisting of a pegmatoidal pyroxenite bounded by two chromitite stringers.

