

The genesis of a “cycle” within UZc of the Upper Zone of the Bushveld Complex (South Africa)

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The variability of P₂O₅ in the UZc of the Upper Zone of the Bushveld Complex is unusual. Apatite in the UZc is not present throughout the whole of the UZc stratigraphy, and appears and disappears from the solidus over very short intervals. P₂O₅ wt% increases from background values of 0.24 P₂O₅ wt% to 8.34 P₂O₅ wt% over less than a centimetre, and the drop in P₂O₅ concentrations is equally as abrupt.

This study focuses on what is called a “cycle” within the Upper Zone; Cycle V [1]. Tegner, *et al.* (2006) [1] attributed these cycles to stratification of the Upper Zone magma chamber by double diffusive convection and subsequent forward crystallisation. This model addressed the unusual reversals in Mg# and An%, as well as P₂O₅ and V₂O₅, at the boundary of each cycle throughout the Upper Zone.

This study seeks to determine the processes that resulted in the lithology, the discontinuous mineralogy and variable apatite behaviour found in Cycle V. Studies by Tollari, *et al.* (2006) [2] and Toplis, *et al.* (1994) [2] have proven that SiO₂ and P₂O₅ are intrinsically linked. Consequently, how did the concentrations of SiO₂-P₂O₅ shape the formation of the UZc of the Upper Zone?

REFERENCES

- [1] Tegner, C., Cawthorn, R., Kruger, F., 2006. Cyclicity in the Main and Upper Zones of the Bushveld Complex, South Africa: Crystallization from a Zoned Magma Sheet. *Journal of Petrology* 47, 2257-2279. [2] Tollari, N., Toplis, M.J. & Barnes, S.J. 2006. Predicting phosphate saturation in silicate magmas: An experimental study of the effects of melt composition and temperature. *Geochimica et Cosmochimica Acta*, 70 (): 1518–1536. [3] Toplis, M.J. Libourel, G. & Carroll, M.R. 1994. The role of phosphorus in crystallisation processes of basalt: An experimental study. *Geochimica et Cosmochimica Acta*. 58 (2): 797-810.