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Processing of the Bushveld Ores

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The two major commodities regularly recovered from the Bushveld Complex are platinum group elements (PGEs) and chromite. While these two commodities often occur together, their processing routes could not be more different, and in the instances of PGEs, the presence of Cr is even a penalty element during smelting.

Processing of commodities originating in the Bushveld has been taking place since the panning of alluvial material as early as 1924. Major advancements have been made in this time, and the current recovery process and controls are now well established. The main processing routes currently employed are PGE flotation and physical separation (gravity concentration) of chromite. As these processes are relatively well constrained, much of the ongoing process mineralogy and optimisation focuses on the identification of mineralogical variability and corresponding shortcomings to address or account for them appropriately.

Amongst other factors, grain size distribution is very relevant to PGE flotation, with both coarse- and fine-grained occurrences presenting challenges. Another important factor is the degree of association with both gangue and sulphides. Some argue that the precise species of PGE mineralisation has an impact on flotation, while others suspect that only specific types of PGEs (such as laurite) represent a significant difference in flotation response. The processing of PGEs is often tailored to the ore, employing flocculant, depressant, and other reagents to optimise conditions for ideal flotation.

There is stark contrast between the finesse of the recovery of trace PGEs and the bulk commodity of chromite. Much of the complexity of chromite processing is ensuring sufficient chromite liberation without major degrees of fines generations.

An evaluation of case studies where atypical mineralogy of both PGEs and chromite have affected the processing route taken will be presented.