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Magmatic reaction and replacement phenomena associated with iron-rich melts migrating through the Upper Critical Zone, Rustenburg Layered Suite, Bushveld Complex

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Numerous irregular bodies of iron rich replacement pegmatite have been described as disturbing, disrupting and displacing the layered series of the Bushveld Complex. Many have been discovered cutting through the mine sequences that host the Merensky and UG2 PGE deposits and their effect on the mineralization has garnered much attention. Whole scale replacement has rendered the platinum-bearing reefs unrecognizable, the PGE re-distributed into patchy zones and often completely removed.

The iron rich bodies are composed essentially of Fe-rich olivine, Fe-rich augite and magnetite, while plagioclase can be locally abundant. Textures are extremely variable, from medium grained granular to megacrystic (Fig. 1a), the latter characterized by elongate prismatic Fe-augite up to 40 cm in length Fig. 1b). Minor minerals include Fe-Biotite, Pyrrhotite, Chalcopyrite, Quartz, Alkali Feldspar and Apatite.

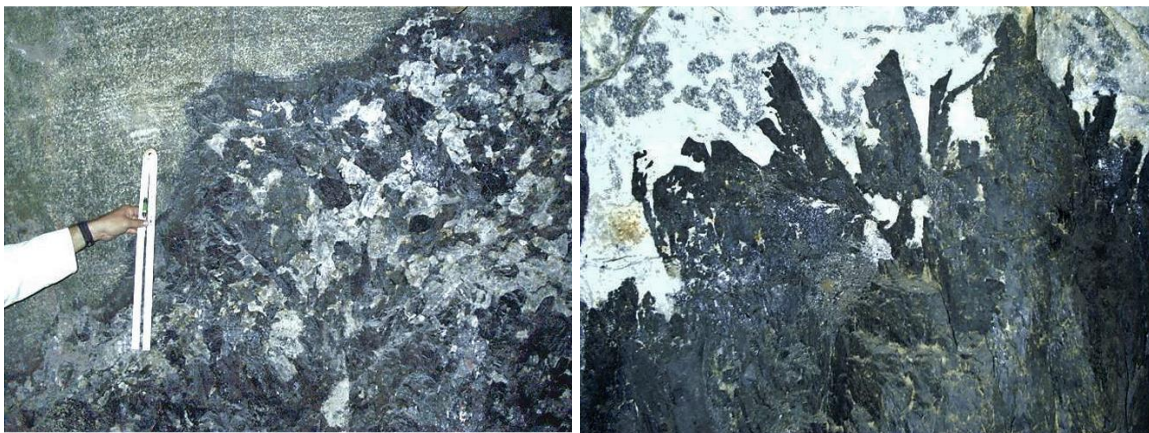


Figure 1. Left (a): Coarse megacrystic Fe-gabbro pegmatite replacing finely laminated norite, UG1 footwall, Northam platinum mine. Folded clinorule is 50 cm long. Right (b): Elongate prismatic Fe-augite extending from a sub-concordant body of iron-rich ultramafic pegmatite (IRUP) up into mottled anorthosite, UG1 footwall, Northam platinum mine. FOV = 50 cm across.

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clear from Figure 1, the contact zones against the country rock can also vary considerably, both in terms of mineralogy and texture, as well as morphology. In particular the margins seldom match like typical

intrusions (planar, parallel, fracture related, dilational), but rather develop scalloped, wavy boundaries more suggestive of replacement/alteration zones.

Inspection of these contact zones reveal several types, one of which is described in detail below:

Fe-norites or olivine gabbros inheriting the granular textures in the country rock (Fig. 1a), are formed when the introduced Fe-melts have encountered norites, the country rock is replaced by a darkened facies where the original magnesian orthopyroxene is replaced by Fe-enriched orthopyroxene and then a Fe-olivine – Fe-augite assemblage. Plagioclase looks unaffected mesoscopically but is cryptically replaced by more An-rich compositions and higher levels of trace Fe. These features all suggest a magmatic reaction between the incoming Fe-melt and a norite mineral assemblage that is unstable. They also infer that the norite country rock was probably still very hot when the reaction/replacement event took place.

