Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.9980

The “trapping” of alkali feldspar megacrysts in the metasedimentary country rocks adjacent to the S-type Peninsula Granite, Cape Granite Suite, Pan African Saldania Belt, South Africa

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The Sea Point contact, Cape Town, South Africa, exposes the contact between the Malmesbury Group metasedimentary rocks of the Pan-African Saldania belt and the S-type Peninsula Granite of the Cape Granite Suite (CGS). The main lit-par-lit contact zone is characterized by numerous compositionally variable granitic injections which intruded parallel to sub-parallel to the country rock structure. This zone passes southward into the coarse-grained, voluminous porphyritic main phase granite. The various granitic phases are characterised by abundant K-feldspar megacrysts (typically of 2-5 cm size) within a variably-grained groundmass. Some of these K-feldspar megacrysts also occur embedded within the mudstone and siltstone of the Malmesbury Group country rock, with or without accompanying envelopes of quartzofeldspathic granitic material (Fig. 1).

While a purely magmatic origin is favoured for megacrysts in the granite itself, the origin of megacrysts in the country rock remain unclear. Textural and compositional study of the K-feldspar megacrysts in all the granitic phases and those embedded in the country rock indicate significant similarities. Texturally, these include Carlsbad twinning, abundant albite exsolution twinning, abundant inclusions, as well as vague, and commonly, poorly defined compositional zoning. This zoning is evident in mineral chemical analyses indicating consistent variations in the concentration of K_2O, Na_2O and BaO. These textural and compositional attributes suggest they formed by similar processes by renewed magma injection and prolonged growth in the presence of multiple magma pulses.

For the embedded K-feldspar megacrysts in the country rock, filter pressing, the mechanism by which melt fractions are segregated from a crystal mush during crystallization, likely occurred. During magma intrusion under a late- to syn-tectonic compressive regime, melt and associated crystals moved into fractures or other free spaces. The melt fraction was more easily mobilized and driven out compared to the crystal fraction (i.e. strain-induced melt loss), leaving the K-feldspar megacrysts (and other smaller phenocrysts and crystals) behind, embedded within the country rock. Evidence to suggest that the megacrysts in both the granitic phases and those within the Malmesbury Group country rock grew due to K-metasomatism and fluid fluxing, is equivocal. Outcrop, textural and compositional evidence point more toward a magmatic origin.