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Infiltration metasomatism within the Rum layered intrusion (Scotland)

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The well studied Rum Isle layered intrusion was built up by emplacement of a series of 15 macro-rhythmic units. Magma intruded 60.53±0.08 Ma (Hamilton et al., 1998), at a pressure <0.5 kbar (Holness, 1999). Units are composed of feldspathic peridotite at the base, overlain by troctolite and gabbro. Layering is induced by fractional crystallization from picritic magma (Upton et al., 2002; Holness et al., 2007). Rum magma liquid line of descent is complicated by reactive melt percolation within crystal mushes, either originating from continuous compaction of the cumulate pile or from a newly injected reactive picritic magma. The studied Unit 9 sequence is well known for the injection of a picritic sill within the layered intrusion.

Clinopyroxene textures are very diverse above the Unit 9 intrusive picritic sill. (1) Late-stage interstitial crystals occur in the basal intrusive peridotite, corresponding to the picritic sill. The $Cr2O_3$ content varies from 1.2 to 0.6 wt% along core to rim profiles. (2) Within the overlying troctolite, poikilitic crystals (up to 2 cm in diameter) enclose randomly oriented plagioclase and olivine, wrapped by a foliated troctolitic assemblage. Within the first 3 meters, the $Cr2O_3$ composition of the few clinopyroxene crystals is very similar to the underlying peridotite one, but it then drops to lower concentration (0.5 to 0 wt%). The plagioclase-clinopyroxene-plagioclase median dihedral angle also decreases from $\sim 90^\circ$ to $\sim 80^\circ$ (Sides, 2008). The $Cr2O_3$ content increases progressively towards the troctolite-gabbro wavy horizon. Gabbroic enclaves occur within the troctolite. (3) Cumulus clinopyroxene grains occur in the summit gabbro. Their $Cr2O_3$ content regularly decreases from 1.2-0.8 to 0.7-0.3 across the gabbro pile. Cr-spinel crystals are rare. Median plagioclase-clinopyroxene-plagioclase dihedral angles evolve from $\sim 85^\circ$ to $\sim 95^\circ$.

We propose that troctolites, that contain gabbroic enclaves, result from clinopyroxene primocryst dissolution from a gabbroic crystal mush, when intruded by subsequent clinopyroxene under-saturated peridotite sills, dykes or fingers. Due to disequilibrium between crystals and invading magma, clinopyroxene is dissolved from the mush, leading progressively to saturation of the percolating magma (Holness et al., 2007) while Cr-spinel crystallizes. After transport along grain boundaries, $Cr2O_3$-poor clinopyroxene is re-precipitated interstitially.

REFERENCES

Hamilton et al. (1998); Rapid eruption of Skye lavas inferred from precise U-Pb and Ar-Ar dating of the Rum and Cuillin plutonic complexes, Nature 394, 260-263.

Holness (1999); Contact metamorphism and anatexis of Torridonian arkose by minor intrusions of the Rum Igneous Complex, Inner Hebrides, Scotland; Geol. Mag. 136, 527-542.

Holness et al. (2007); Infiltration Metasomatism of Cumulates by Intrusive Magma Replenishment: the Wavy Horizon, Isle of Rum, Scotland, J. Petrol. 48(3), 563-587.

Sides (2008); Crystal Mushes in Mafic Magma Chambers. Cambridge University; PhD Thesis; 217p.

Upton (2002); Picritic magmas and the Rum ultramafic complex, Scotland; Geol. Mag. 139, 437-452.