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Non-peridotitic xenoliths and megacrysts from Loch Roag monchiquite (Outer Hebrides, UK): messengers from lower crust or echoes of mantle processes – preliminary studies.

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The Mid-Eocene [1] Loach Roag monchiquite dyke carries abundant peridotitic, pyroxenitic , mafic and felsic xenoliths and megacrysts. The peridotitic xenoliths sample Archean mantle underlying marginal parts of the North Atlantic Craton, whilst non-peridotitic ones provide data on the mantle/ lower crust transition and shallower crustal depths. The non-peridotitic lithologies include xenoliths of: norites, gabbros, clinopyroxenites, clinopyroxene ($\pm$ orthopyroxene), syenites, anorthoclasites, glimmerites and megacrysts of clinopyroxene, biotite and alkali feldspar. The xenoliths contain variable amounts of Fe-Ti oxides, biotite and/or apatite. The anorthosclasites also contain corundum, zircon and HFSE oxides. [2] . Some of the xenoliths have typical adcumulate textures. The megacrysts are usually free of inclusions, although K-feldspar megacrysts may enclose apatite, biotite and clinopyroxene.
Clinopyroxene Mg# values decrease from 80 in clinopyroxenites and megacrysts to 55 in syenites, anorthoclasites and K-feldspar megacrysts; at low Mg# ($\sim$55) values the clinopyroxenes in the plagioclase-bearing rocks are poorer in Al than those coexisting with K-feldspar (0.10 vs. 0.40 a.pfu., respectively). The clinopyroxenes are all LREE-enriched, but their normalized trace element concentrations are lower in the K-feldspar-bearing rocks. Clinopyroxene from norite has s a distinct negative Eu anomaly but this absents from those in the anorthoclasite . Mg# of the orthopyroxene is always lower than that in coexisting clinopyroxene. Compositions of plagioclase vary from An60-40 in gabbros/norites to An10 in syenites. K-feldspars in anorthoclasites and megacrysts have constant orthoclase contents of 81 to 84. Biotite in the clinopyroxenites has Mg# significantly higher than those in the anorthoclasites and as inclusions in K-feldspar megacrysts (72 vs. 45, respectively).
Mafic rocks of cumulative origin (including pyroxenites, norites and gabbros) are interpreted as products of mafic magmas underplating the lower crust. There is compositional continuum of minerals from the pyroxene-rich rocks to the syenites suggesting that the latter may also be differentiates from the mafic magmas. In contrast, the K-felspar-bearing rocks show no affinity with the “pyroxenitic”-suite and probably have a distinct genesis.
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[1]Faithfull et al. (2012), Journal of Geological Society, 169, 115-118; [2] Upton et al., (2009), Mineralogical Magazine, 73, 943-956