# Mg- and Fe-rich wehrlites: products of progressive melt/peridotite reaction?

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Mantle wehrlites brought to the surface by basaltic rocks are ubiquitously interpreted as the result of the impregnation of refractory peridotites by migrating melts. Wehrlites can be very variable in terms of chemical compositions, suggesting that they can be produced by a large compositional spectrum of melts. Wehrlites with moderate to strong enrichment in Fe occur world-wide; nevertheless, major interest has been focussed on the characterisation of magnesian ($Fo_{Ol}$>90) wehrlites, which have mainly been attributed to metasomatism operated by Na-carbonatite melts rising from deep source.

The presence of coexisting high-Mg and high-Fe wehrlites is rare in mantle xenolith occurrences. At Ibalrhatene, in the volcanic district of Azrou-Timhadite (Mid Atlas, Morocco), a maar (1 km wide) contains wehrlite xenoliths which show a large compositional and textural variability and are associated with metasomatised (i.e. amphibole-bearing) lherzolites and harzburgites with protogranular to porphyroclastic textures. The abundance in the mantle column beneath Mid Atlas of wehrlites and associated coarse–granular spinel (±garnet) websterite and clinopyroxenite/ hornblendite samples with cumulus texture provides evidence for infiltration and channelling into the lithospheric mantle of increasingly larger volumes of melts and offers the precious opportunity of unravelling the significance of high-Mg and high-Fe wehrlites and their genetic relationships.

Textural and chemical evidence (LAM and TIMS data) indicate that Mg-wehrlites formed in mantle sectors which are located at the top of the sampled mantle column or far from magma chambers and conduits during early interaction with residual, highly evolved melts. This process resulted in localised and extreme LILE and LREE enrichment that was progressively erased as ambient peridotite mantle deeply re-equilibrated with new, and volumetrically larger, batches of primitive alkaline melts leading to the formation of Fe-wehrlites.

In this respect, Azrou-Timhadite wehrlites provide an interesting example of how reactive porous flow is efficient in progressively erasing more pronounced chemical effects of metasomatism operated by small fractions of highly evolved residual melts.