

Mineralogical Indicators of Mantle Metasomatism: a Review

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Mantle metasomatism (**MM**) is caused by either melts (m) and/or fluids (f) and occurs in various plate tectonic settings. Secondary mineral assemblages may be superimposed on primary rock fabrics commonly distributed as (i) veins, (ii) along grain boundaries or (iii) mineral replacements. Interpretation of **MM** assemblages rely on multiple analytical techniques, in order to relate mineral chemistry to host rock chemistry, including grain-scale isotope systematics. Examples of **MM** in peridotitic mantle can be approximately related through experiments to depth zones: (a) Alkali basaltic m-metasomatism (2-3 GPa) with *Cpx*, apatite and Ti-amphibole; (b) kimberlitic metasomatism (4-6 GPa) with phlogopite, richterite amphibole, Ti-oxides, diopside and apatite or carbonate. Carbonatitic metasomatism is often represented by enhanced *Cpx/Opx* ratios in effected peridotitic rocks. Recent examples of **MM** in peridotitic xenoliths associated with mixed carbonatite-silicate systems from Italy and East Africa are considered. Sulphides have long been ignored in mantle xenoliths but present important new information. Diamonds also preserve a unique record of long term **MM**, including high-pressure mineral assemblages. Detailed diamond growth events can sometimes be related to coupled **MM** in both peridotite or host eclogites. New evidence of mantle minerals, which may demonstrate shock deformation associated with, for example, giant impact is currently being sought.