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Amphibole and phlogopite genesis in pyroxenites from the Beni Bousera peridotite massif (Rif, Morocco): Evidence for two different metasomatic episodes.

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The garnet websterites and garnet clinopyroxenites from the Beni Bousera peridotite massif contain varying amount of amphibole ± plogophite. The presence of amphibole in both pyroxenites indicates that post-formation metasomatism has affected these pyroxenites.
Textural observations, associated with major and trace element compositions of minerals allow distinguishing two metasomatic episodes, occurring at two different periods of the evolution of the Beni Bousera massif.
Garnet websterites record interactions with LREE-rich silicate melt before the uplift of the massif, and crystallization of interstitial amphibole and phlogopite. Partition coefficients between amphibole and matrix clinopyroxene and garnet indicate that the former is in chemical equilibrium with the pyroxenite minerals. The fluid responsible for the metasomatic episode is an alkali silicate melt originating from the partial melting of a peridotitic source similar to the source of the recent basaltic magmas erupted in Morocco.
Garnet clinopyroxenites show the crystallization of amphibole and plagioclase at low P-T conditions during the ascent of the Beni Bousera massif. Amphiboles are in chemical disequilibrium with the pyroxenite matrix minerals. The melt responsible for this event is depleted in LREE and highly enriched in HREE. Such a melt can be produced by partial melting of a garnet-bearing source, with garnet as a melting phase, similar to the garnet pyroxenites from the Beni Bousera massif.

Keywords: Metasomatism; amphibole; garnet websterite; garnet clinopyroxenite; silicate melt; Beni Bousera, partial melting.