

Acicular and fibrous orthopyroxenes in the volcanics from Santa Maria di Licodia (Sicily, Italy)

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The volcanic dome of Santa Maria di Licodia is located on the SW side of Mt. Etna volcano, close to the Mount Calvario dome (Biancavilla). Some significant differences show the two domes, such as the composition (benmoreite and mugearite, respectively) and the presence of a fibrous orthopyroxene (in the first dome) instead of fibrous fluoro-edenite [1] (in the second one).

Fibrous orthopyroxene is rare in nature, and it is prevalently found in metamorphic rocks [2,3] and in ultramafic xenoliths as an autometasomatic product of hydrous magmas [4]. Until today no evidence of volcanic orthopyroxene was highlighted in literature.

Preliminary studies [5,6] did not highlight metasomatic processes on both central (massive) and external portion (autobrecciated) of the Santa Maria di Licodia dome. Orthopyroxene, associated to alkali-feldspars (Na), augitic clinopyroxene, apatite and Fe-Ti oxides, shows different morphology, such as prismatic, acicular and fibrous. The prismatic morphology occurs in the massive portion, whereas the acicular and fibrous morphology in the brecciated portion. The mineralogical characterization of the orthopyroxene was performed by different analytical techniques (EMPA, SEM-EDS, XRPD). By SEM-EDS investigation a large composition variability within the fibrous orthopyroxene was evidenced. Different morphology correspond to differences in composition, in particular in the iron contents. The prismatic and acicular morphologies show a composition with high Fe content (up to 18-20 wt% FeO), whereas the fibers present higher Mg content and FeO <11%. Moreover, the highest Fe contents are generally associated to moderate Ca enrichments (about 1-2 wt% CaO). X-ray investigation allowed to identify and define the orthopyroxene as enstatite and ferroan-enstatite, also confirmed by the chemical micro-analyses.

The various orthopyroxene morphologies lead to hypothesize different conditions of the dome emplacement (i.e. temperature and cooling rate). However, the fibrous morphology could depend by very fast cooling from high temperatures. Finally, the presence of fibrous orthopyroxene in this locality could represent a potential risk for the human health in comparison to the morphology and composition to the fluoro-edenite fibers occurred in the Biancavilla area and responsible of the pleural mesothelioma in the local inhabitants.

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