Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.14338

Albitic jadeite and majorite in L6 ordinary chondrite Northwest Africa 4137

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It is widely known that ordinary chondrites, and in particular the L6 subgroup, show a variety of shock features that record hypervelocity collisions and help us to reconstruct the impact history of their parent bodies. The discovery of high-pressure (HP) phases, commonly found within melt veins (MVs), is particularly useful for constraining shock conditions. Albitic jadeite and majoritic garnet are such HP phases [1,2]. In Northwest Africa (NWA) 4137 (find; L6, S3, W2) a thick MV (up to ~300 μm wide) and numerous thinner MVs (from few μm up to ~100 μm) are present. Herein, we report on the occurrence of two HP phases – albitic jadeite and majorite –within the same MV. We analysed seven regions of interest in the thick MV on a polished thin section by using optical and scanning electron microscopy, electron microprobe (EPMA), and Raman spectroscopy (RS).

The albitic jadeite occurs in the thick MV of NWA 4137 as irregularly shaped crystals, up to 50 μm in size, with the empirical formula $(Na_{0.61\text{-}0.64}Ca_{0.08}K_{0.02\text{-}0.05}o_{0.25\text{-}0.29})_{M2}(Al_{0.76\text{-}0.83}Si_{0.12\text{-}0.17}Fe_{0.02\text{-}0.08}Mg_{0\text{-}0.15})_{M1}Si_2O_6$. The garnet grains occur either as equigranular crystals with 120° triple junctions composing the groundmass of the MV or as isolated euhedral crystals. Their composition is close to ideal majorite, $(Mg_{2.15\text{-}2.16}Fe_{0.74\text{-}0.76}Ca_{0.05\text{-}0.06}Mn_{0.02\text{-}0.03}Na_{0\text{-}0.01})_X(Mg_{0.93\text{-}0.95}Fe^{3+}_{0.07\text{-}0.10}Al_{0.01\text{-}0.01}Ti_{0.01\text{-}0.01}Si_{0.93\text{-}0.94})_YSi_3O_{12}$. Albitic jadeite and majorite were confirmed with RS; the characteristic major peaks were observed at ~700 cm^{-1} in albitic jadeite and ~927 cm^{-1} in majorite. Up to now, there are no experimental data on the stability field of albitic jadeite. In contrast, majorite composition is pressure sensitive and thus can be used as a barometer; for NWA 4137 majorite – using the barometer formulation of Collerson et al. [3] – the *P* is estimated at ~23 GPa.

NWA 4137 hosts two high-*P*,*T* phases in a setting and assemblage that resemble those described in other L6 chondrites. Additional work will focus on whether other HP phases occur in this meteorite and whether multiple generations of MVs are present in NWA 4137.

[1] Baziotis I. et al. (2022) Am Min, 107, 10, 1868–1877. [2] Ma C. et al. (2022) Am Min, 107(4), 625–630. [3] Collerson K. D. et al. (2010) GCA, 74(20), 5939–5957.