

Low-salinity aqueous fluid inclusions in dolomite veins of a listvenite of Oman Drilling Project Phase 1

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There are numerous gas and liquid, two-phase inclusions in dolomite crystals in a white-green-colored listvenite recovered through Oman Drilling Project Phase 1 (specimen name z68w). Most of the fluid inclusions are tiny, <6 micrometer across and seems to be too small to provide detectable Raman spectra of fluids. Fluid inclusions >6 micrometer across in dolomite provide Raman spectra of H₂O, but they become dark possibly due to destruction during the cooling processes and usually prohibit from observation of melting ices. So far, Raman microscopy indicated that they are filled with H₂O and do not detect any other gasses such as CH₄ or CO₂. Melting temperature of ice in the tiny fluid inclusions, on a Linkam THM600 heating stage with a Nikon 100X objective lens indicates that they are filled with saline fluids with 1.1 ±0.5 wt% NaCl equivalent (n=42, Figure 1), which is much lower than that of seawater (3.5 wt% NaCl). Homogenization temperature of vapor-liquid suggests that the fluid inclusions were formed at temperature >139 ±31 °C (n=8, Figure 2). The fluid inclusions are mainly in dolomite veins, which cut magnesite and quartz (Figure 3, Raman mapping of magnesite, quartz, and dolomite). The present data indicate that low-salinity aqueous fluids were available during the crystallization of dolomite veins after the formation of magnesite-quartz assemblage. If seawater carries carbon to form listvenite from peridotite or serpentinite, the present low-salinity data suggest that chlorine needs to be absorbed by some phases during the fluid migration or be diluted by mixing with meteoric water.

Keywords: seawater, carbon cycling, serpentinite, serpentine, carbonate, carbonation

Figure 1 Histogram of salinity.

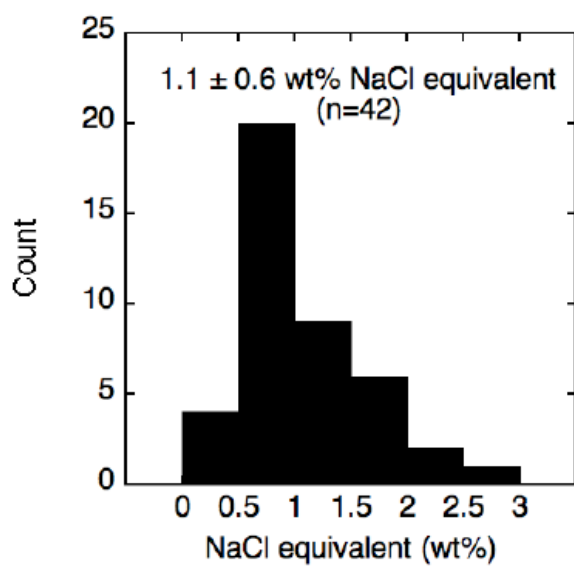


Figure 2 Homogenization T vs salinity.

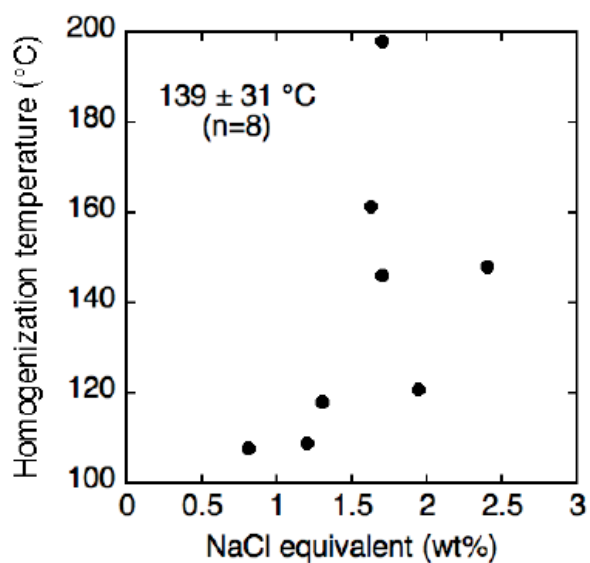


Figure 3 Microphotograph of a listvenite under transparent light (7.5mm wide) and Raman mapping images showing the distribution of magnesite, quartz, and dolomite.

