INVESTIGATION OF DATOLITE ($CaB[SiO_4/(OH)]$) FROM BASALTS IN THE NORTHERN APENNINES OPHIOLITES (ITALY): GENETIC IMPLICATIONS

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ABSTRACT

Datolite, ideally CaB[(OH/SiO4)], from hydrothermal veins crosscutting pillow basalt in 10 different localities of the Northern Apennine ophiolites was investigated with regard to mineral chemistry and fluid inclusion microthermometry. Bulk analyses of datolite crystals show REE contents below chondritic, except for La and Ce. With respect to host rock, datolite is occasionally enriched in La, Rb, Cs, Be, and shows relatively high contents of chalcophile elements (Cu, Zn, Pb, Ni) when occurring in contact with sulfide-mineralized basalt. Volatiles escaped during the decomposition in the temperature range 600 and 700 C. The main component is water. The temperature maximum of water release is different and frequently with a shoulder or a second maximum. Together with water, sulfur species as H2S and SO2 and traces of boron species escaped. The CO2 release by the decomposition especially of datolite from Castellaro and Cinghi has a maximum in the range of 500–580 C and is different from the decomposition of calcite. Together with CO2 a boron species escaped. Chlorine does not detect. Two-phase (L+V) fluid inclusions texturally identifiable as primary and secondary were observed, yielding average homogenization-temperatures of 236 and 173 C, respectively. Fluid inclusion cooling data yield calculated salinity in the range of 10–16wt% NaCl equivalents, thus relatively higher compared with seawater. The results are compatible with those reported for fluids formed under diagenetic conditions, but differ from those observed in seafloor hydrothermal systems and/or emanating from magmas. Distribution of trace elements between datolite and host basalt indicates enrichment with respect to the host rock limited to a few elements such as La, Rb, Cs, Be, Ni, Cu, Zn and Pb. The lithophile elements can be hosted in the datolite lattice, whereas the chalcophile metals and Ni are probably carried in sub-microscopic inclusions.

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