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No 5155

ENVIRONMENT OF FORMATION OF CALCITE VEINS FROM YUCCA MTN, (NV) TUFFS AS EVIDENCED BY FLUID INCLUSION CRUSHING STUDIES

ROEDDER, Edwin, Dept. Earth and Planetary Sciences, Harvard University, Cambridge, MA 02138; WHELAN, Joseph F., U. S. Geological Survey, Box 25046, Denver Federal Center, Denver, CO 80225; VANIMAN, David T., Group EES-1, MS D462, LANL, Los Alamos, NM 87545

425-1029

Calcite vein and vug fillings at four depths (~~587-886~~ ft., all above the present water table) from borehole USW G-1 at Yucca Mountain, Nevada (presently under study as a potential repository for high-level radioactive wastes), show two types of primary fluid inclusions: either full of liquid, or of vapor. The latter have several possible origins, but formed most likely from the trapping of vapor from a two-phase system of vapor + liquid. This vapor may have consisted of pure steam, or of air and/or CO₂ saturated with water vapor at the temperature of trapping.

Crushing in oil provides a rough qualitative estimate of the gas pressure within an inclusion at the time of crushing. The volume of the inclusion before crushing, and of the bubble remaining after crushing are estimated optically; a volume decrease is a measure of original water vapor content, and hence of the temperature, at the time of trapping. Ten vapor inclusions all sucked in amounts of oil corresponding to trapping temperatures <100°C.

These inclusion data impose some useful constraints on the depositional environment but leave several ambiguities. The lack of shrinkage bubbles in even large liquid inclusions suggests low trapping temperatures, probably <100°C. The partial collapse of the vapor inclusions requires the presence of gases other than just steam, but does not discriminate between air and CO₂. Gas analysis of individual inclusions is planned. The two types of inclusions require trapping from a heterogeneous liquid + vapor system. The liquid phase, however, could have been merely a film on the walls of an otherwise vapor- or air-filled vein or vug opening, in a system above the water table (i.e., unsaturated condition), or the vapor phase could represent effervescence of CO₂ in an essentially liquid-saturated system (below the water table). Without gas compositions the age or direction of flow of water in the veins during calcite crystallization is not constrained by the inclusion data.

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