The occurrence and significance of quartzine in open spaces in a basaltic flow: Dunn Point Formation, Nova Scotia.

STUART MACNEIL
Department of Earth Sciences, St. Francis Xavier University, Antigonish, Nova Scotia B2G 2W5

Irregularly rounded masses of microcrystalline silica were discovered within a large narrow cavity (40 cm in length) in a basaltic flow within the ca. 460 Ma Dunn Point Formation, Arisaig, Nova Scotia. X-ray powder diffraction patterns indicate that the rounded masses consist of low quartz (var. chalcedony) with no trace of the polymorph moganite or opal-CT. This exceptional mineral occurrence offers an opportunity to examine the products of late geothermal fluids and provides insights into the nature and thermal history of the fluid responsible for chalcedony precipitation in the Dunn Point Formation. The chalcedony has a waxy luster, is milky white in colour,

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and forms a nearly continuous layer (1 to 3 cm thick) on the walls of the cavity. Observation of thin sections cut perpendicular to the walls of the cavity indicates that the chalcedony comprises two textural types: a fine grained (100 to 400 μm) plumose aggregate and spherulitic masses composed of fibers up to 1 cm in length that overgrow the finer grained material. Individual fibers are elongate parallel to [0001] indicating that the chalcedony is a relatively rare variety known as quartzine. A dark green rind (2 to 3 mm thick) at the contact between the basalt and quartzine is composed almost entirely of crystals of magnetite surrounded by radial aggregates of chamosite.

Quartzine is indicative of precipitation from silica-rich alkaline fluids. The alkaline nature of the late-stage fluids in the Dunn Point Formation is supported by the occurrence of analcime in other nearby cavities in the basalts. The aqueous silica activities for chalcedony as a function of temperature have been calculated using SUPCRT92 software. These data can be combined with geothermometric measurements obtained from chamosite and fluid inclusions to constrain the silica activity in the precursor fluid. The observed textures and environment of deposition indicate two stages of deposition of silica from a highly supersaturated fluid phase in response to pressure release.