First direct evidence for natural occurrence of colloidal silica in chalcedony-hosted vacuoles and implications for ore-forming processes

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Figure 1. Optical (A,C) and panchromatic cathodoluminescence (B) images showing polished section of chalcedony (1) in basalt (2) and occurrence of chalcedony-hosted fluid-filled vacuoles. Box in A shows location of B.

Figure 2. Optical image (A), Raman map (B), and part (2500–3900 cm⁻¹) of Raman spectra (C) of a single vacuole in chalcedony showing (1) H₂O-bearing outer chalcedony layers (dark in Fig. 1B), (2) H₂O-poor inner bands around the vacuole, (3) aqueous fluid, and (4) methane-bearing shrinkage bubble.

Figure 3. Snapshots in plane-polarized transmitted light showing phase transformations inside typical vacuole in chalcedony at room temperature (A), during experimental cooling (B, F–H), and heating (C–E).

Figure 4. Scattering of light (laser pointer, direction of illumination is shown by arrows) inside chalcedony-hosted vacuole (A), artificially made sol of silicic acid in glass capillary (B), and low-salinity aqueous fluid inclusion in hydrothermal quartz (C). Left-hand images were obtained in plane polarized light; right-hand images obtained by side laser beam illumination.

Figure 5. Colloform chalcedony hosting zones of bonanza grade gold from the epithermal gold deposit Kochbulak, Uzbekistan.