

Monoclinic tridymite in clast-rich impact melt rock from the Chesapeake Bay impact structure

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ABSTRACT

X-ray diffraction and Raman spectroscopy confirm a rare terrestrial occurrence of monoclinic tridymite in clast-rich impact melt rock from the Eyreville B drill core in the Chesapeake Bay impact structure. The monoclinic tridymite occurs with quartz paramorphs after tridymite and K-feldspar in a microcrystalline groundmass of devitrified glass and Fe-rich smectite. Electron-microprobe analyses revealed that the tridymite and quartz paramorphs after tridymite contain different amounts of chemical impurities. Inspection by SEM showed that the tridymite crystal surfaces are smooth, whereas the quartz paramorphs contain irregular tabular voids. These voids may represent microporosity formed by volume decrease in the presence of fluid during transformation from tridymite to quartz, or skeletal growth in the original tridymite. Cristobalite locally rims spherulites within the same drill core interval. The occurrences of tridymite and cristobalite appear to be restricted to the thickest clast-rich impact melt body in the core at 1402.02–1407.49 m depth. Their formation and preservation in an alkali-rich, high-silica melt rock suggest initially high temperatures followed by rapid cooling.

Keywords: Monoclinic tridymite, quartz paramorph after tridymite, cristobalite, Chesapeake Bay impact structure