
Replacement of Quartz by Opaline Silica during Weathering of Petrified Wood

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Abstract: A mineralogical investigation by X-ray powder diffraction and optical, scanning, and transmission electron microscopy of partially weathered petrified wood in the Yegua Formation (Eocene) of east-central Texas revealed that microcrystalline quartz present in the unaltered petrified wood has been gradually dissolved and replaced by disordered silica polymorphs (mainly opal-CT) as a result of weathering. This replacement suggests that the reaction sequence: opal-A → opal-CT → quartz, which has been described elsewhere to occur during diagenetic alteration of petrified wood, is apparently reversed when the petrified wood is exposed to low-energy weathering conditions. The relatively high rate of dissolution of the quartz in the petrified wood appears to be related to its small crystallite size. The silica released by the dissolution of the quartz is subsequently reprecipitated as disordered cristobalite-tridymite (opal-CT) and poorly crystalline silica (opal-A) that, in turn, probably converts to opal-CT on aging. Opal-CT is the major silica phase in the completely altered powdery material enclosing the partially weathered petrified wood. The intermediate zone between the altered and unaltered zones contains both quartz and opal-CT.

Key Words: Opal-A • Opal-CT • Petrified wood • Quartz • Silica • Weathering

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