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Mineralogical characterization of silica sinters from the El Tatio geothermal field, Chile

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Abstract

Silica sinters, deposited from alkali chloride waters in the El Tatio geothermal field in northern Chile (22°20'S, 68°01'W), have been characterized by XRD, SEM, TG-DTA, and FTIR. The dominant silica phase is opal-A. Minor contents of opal-A/-CT and opal-CT are also present together with halite (NaCl), sylvite (KCl), and realgar (AsS). Accessory phases include teruggite [$Ca_4MgAs_2B_{12}O_{22}(OH)_{12}\cdot 12(H_2O)$], sassolite ($H_3BO_3$), and detrital quartz ($SiO_2$). FWHM values reflect the immature nature of the studied opal-A. DTA heating experiments of opal-A show cristobalite crystallization at ~1000 °C, whereas DTA cooling experiments show the $\beta \rightarrow \alpha$-cristobalite transformation at ~200 °C. The total weight loss is related to changes in the sinter microtextures, mineral phases, and organic matter contents. FTIR spectra show the effects of silica maturation as consequence of the loss of trapped and absorbed water attached to silanols.

Keywords: Opal-A, opal-A/-CT, opal-CT, XRD, TG, DTA, FTIR