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HRTEM investigation of microstructures in length-slow chalcedony

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ABSTRACT

High-resolution transmission electron microscopy reveals dense Brazil-twin boundaries on the unit-cell scale in length-slow chalcedony. The twins can be considered as the result of stacking of left- and right-handed quartz with a (101) twin composition plane. Although most twin sequences on the unit-cell scale are nonperiodic, moganite-type domains result where they are periodic. It is proposed that the twins formed during rapid crystallization rather than as transformation products of a precursor phase such as moganite. The twin boundaries are energetically less stable than twin-free areas and may indicate non-equilibrium crystallization at a high supersaturation of aqueous SiO_2 species in the parent fluid.