

Twinning in synthetic anorthite: A transmission electron microscopy investigation

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ABSTRACT

Transmission electron microscopy (TEM) has revealed dense, complex twins in synthetic anorthite crystals formed by annealing $\text{CaAl}_2\text{Si}_2\text{O}_8$ glass. The crystals are dominated by Carlsbad and Carlsbad-albite twins, with small amounts of albite twins. All the composition planes are parallel to (010). High-resolution TEM images show the twin boundaries to be coherent. Selected-area electron diffraction (SAED) patterns containing the b^*-c^* reciprocal plane are useful for distinguishing these twins. Extremely dense Carlsbad twins at the unit-cell scale indicate that additional energy caused by the Carlsbad twin boundaries in highly disordered anorthite is lower than that caused by albite twin boundaries. We propose that for anorthite with an initially disordered structure the total energy induced by Carlsbad twinning is lower than that caused by albite twinning and higher than that caused by albite twinning in anorthite with an initially ordered structure.