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Application of precession electron diffraction to the characterization of (021) twinning in pseudo-hexagonal coesite

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Abstract

Precession electron diffraction is used to characterize a (021) twin observed in coesite. Due to the quasi-hexagonal dimensions of coesite (monoclinic space group $C12/c1$ with $\beta = 120.34°$), indexing of conventional spot patterns is ambiguous and the twin law determination is impossible. With precession, spot intensities enable the absolute indexing of the patterns. The method we used is based on the analysis of the departure from hexagonal symmetry. This ensures that all possible pseudo-equivalent monoclinic orientations are taken into account for the indexing. The orientation relationships between adjacent parts of the twin are then characterized. The twin is described as a mirror along (021), which is consistent with original descriptions of twinning in synthetic coesite and a previous characterization performed using large-angle convergent-beam electron diffraction (LACBED).

Keywords: Coesite, twin, TEM, precession electron diffraction