

LETTER

Crystallographic alignments in a coccolith (*Pleurochrysis carterae*) revealed by electron back-scattered diffraction (EBSD)

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ABSTRACT

Crystal orientations of the sub-micrometer-sized calcite units in oval-shaped coccoliths of a coccolithophore, *Pleurochrysis carterae*, have been investigated using electron back-scattered diffraction (EBSD). Although the contrast of the acquired EBSD patterns was weak due to the small crystal unit size, the orientations could be uniquely determined from the patterns. The crystal orientations for V- and R-units are close to those reported in a previous work using electron diffraction in a TEM. However, more accurate crystal orientations corresponding to the coccolith morphology were obtained by using EBSD in a SEM. In V-units, the *c*-axis is declined about 35° from the normal of the coccolith plane and one of the *a*₁-axes is roughly parallel to the coccolith plane. The *c*-axis in R-units is slightly oblique to the radial direction along the coccolith plane and one of the *a*₁-axes is near vertical to the coccolith plane. The projections of the *c*-axis of V- and R-units on the coccolith plane deviate considerably from the normal of the coccolith circumference, giving a crystallographic chiral property. The atomic arrangements of calcite contacted with the organic base plate are discussed for both units based on the crystallographic orientations derived from EBSD measurements.

Keywords: Biomineralization, coccolith, EBSD, SEM, calcite