Minerals templated at organic interfaces

Beamline: X6B, X22A

Technique: X-ray Diffraction

Researchers:
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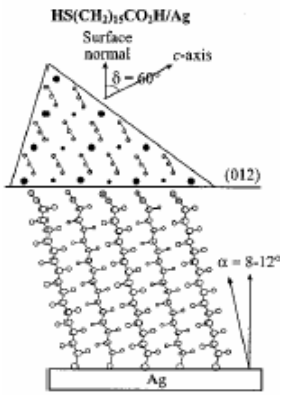
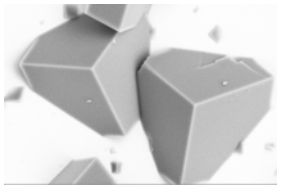
Publication:
S.-Y. Kwak et al. "Orientation and Mg incorporation of calcite grown on functionalized self-assembled monolayers" *Cryst. Growth & Design* 5 (2005) 2139.

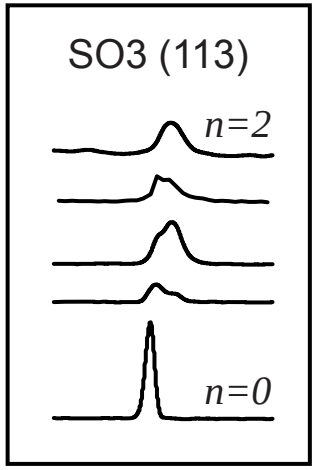
Motivation:
Design of high performance nanocomposite materials, inspired by biomineralized structures, is thought to be possible using appropriate organic templates. This requires an understanding of crystallization at the organic interface, and the effects of additives like Mg.

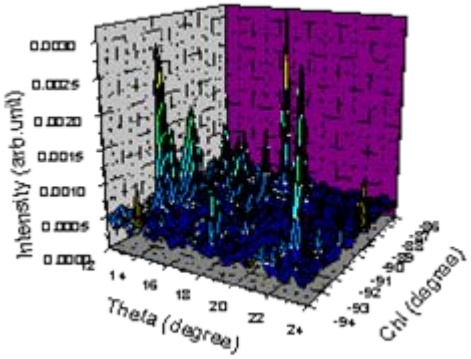
Results:
For calcium carbonate crystals oriented on self-assembled monolayers, the previously held notions of epitaxy between substrate, organic, and mineral were challenged by synchrotron x-ray scattering studies.

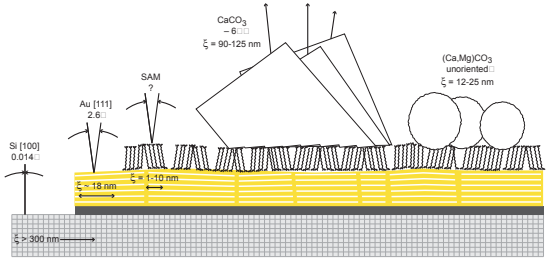
Using high resolution x-ray diffraction, we quantified the structural correlations and discovered two-phase coexistence of particles created by the biomimetic process. Published by invitation in a special issue of Crystal Growth & Design devoted to Biomineralization.











Clockwise from top left: the functional groups at the surface of self-assembled films correspond in their orientation with crystal faces which are preferentially nucleated. By studying diffraction intensity as function of sample tilts theta and chi, a composite picture of the respective textures of the film components can be made. High resolution measurements distinguish peak splitting.