Einladung „CRC Geobiology Lecture Series“ (08. Dez.)

Im Rahmen unserer Vortragreihe möchten wir Sie herzlich zum Vortrag von Derk Joester (Evanston, USA) einladen:

"Biomineralization: from Chemical Nano-Structure to Engineering Crystal Growth and Environmental Remedation of 90Sr"

Termin: 08. Dezember
Zeit: 16:00 Uhr ct
Ort: MN 14

Wir hoffen, Sie werden die Zeit finden an diesem Termin teilzunehmen.

Mit freundlichen Grüßen,

Joachim Reitner

**Abstract:** Biomineralization is a bottom-up synthetic process that results in the formation of inorganic/organic nano-composites with unrivalled control over crystal properties, hierarchical structure, and mechanical properties. The biological design principles and synthetic strategies, however, remain poorly understood. This is at least in part because three-dimensional mineral-matrix interfaces with a roughness at the nanometer length scale are very challenging to investigate by conventional imaging and scattering techniques. The presence of multiple chemical species at low abundance and with low atomic number (Z) further raises the bar. We have demonstrated that atom probe tomography (APT), an imaging mass spectrometry technique of unrivalled spatial resolution (<0.2 nm) and sensitivity, allows us to dramatically improve our understanding of the complex chemistry and structure of nano-scale organic/inorganic interfaces. We will discuss application of APT to tooth biominerals\(^1\) and preliminary data from nano-materials to cement hydration and kerogen.

While APT imaging greatly improves our ability to design bio-inspired routes to hierarchical materials *de novo*, we believe that direct engineering of the biosynthetic machinery may offer an alternative route to adaptive/self-healing materials. We have demonstrated, for example, that micro-patterned cell culture surfaces allow us to control the cooperative growth of oriented, smooth, cylindrical calcite single crystals by sea urchin primary mesenchyme cells (PMC) many times larger than individual cells.\(^2\) We report here that the use of a growth factor endogenous to the sea urchin embryo, VEGF, greatly improves our ability to control the bottom-up synthesis of single crystals to include branching along specific crystallographic directions. Finally, we report on our investigation of the selective sequestration of Sr and Ba by a desmid green alga, *Closterium moniliferum* using synchrotron X-ray fluorescence microscopy.\(^3\) The unusual formation of strontium-substituted barite (Sr,Ba)SO\(_4\) crystals in highly radiation-resistant *Closterium* may offer alternative approaches to nuclear waste treatment and environmental remediation in the wake of Fukushima-type incidents.\(^4\)

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