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Department of Mechanical Engineering
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"Biological Production of Mineralized Nanostructures and Its Implication to Bio-Inspired Material Design and Effective Therapies for Human Diseases"

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Abstract

Biomineralized structure exhibit shapes containing faces or pseudofaces not expressed in crystals grown from pure solutions. Understanding the underlying principles by which small molecules and macromolecules modify the shape can shed light on biomineral processes and suggest strategies for design of modifiers to control synthetic crystal habits.

This talk presents our comprehensive investigation of stereochemistry and molecular scale growth modification on crystal surfaces of calcite and calcium oxalate monohydrate, two common biominerals, by small molecules, polypeptides, and proteins using *in situ* atomic force microscopy and molecular modelling. Examples will be given from the two systems to illustrate the important conclusion of that important molecular-scale interaction that drives modification is between the additives and a specific set of steps on the existing crystal faces. And the discussion will be made on the implication of new finding to bio-inspired material design and to the development of more effective therapies for human diseases.

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About the Speaker

Dr. Roger Qiu is a staff scientist at the Lawrence Livermore National Laboratory, University of California. He received his Ph.D. in physics from the University of California, Riverside in 2000. He received National Science Foundation Fellowship and the Poe Memorial Scholarship Award for outstanding graduate research. He also won the First Place Award for the Best Student Research in the SCCAVS "Leading Edge in Southern California Solid State Research" Symposium and was the finalist for the Morton M. Traum Award for the Best Student Research in Surface Science, American Vacuum Society in 1999. He was a senior staff physicist in Semiconductor Solution, Schlumberger Technologies, San Jose, CA before taking a position at the Lawrence Livermore National Laboratory in 2002. His research interests include biomineralization, bio-molecular imaging, physics of crystal surface/interface in solutions and in UHV, and physics and chemistry of crystalline defects. For the past a few years, he has made significant contributions to the understanding of biological control of crystallization and was recognized by two cover articles in the Proceedings of the National Academy of Science, USA and the Advance Materials, respectively.