Tkach, Colleen

From: Inform
Subject: EM: Keck Science Department Seminar Announcement

From: Soto, Lauran

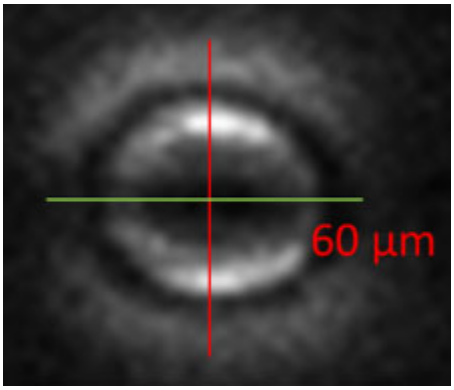
KECK SCIENCE SEMINAR ANNOUNCEMENT

"Imaging Local Electric Fields Produced upon Synchrotron X-ray Exposure: Exploring Weird Data"

Christopher Dettmar, Ph.D.
Keck Science Department
Visiting Asst. Professor of Chemistry

Friday, January 26, 2024
Burns Lecture Hall
12:15-1:15 PM

ABSTRACT: When attempting to monitor X-ray-induced protein crystal damage via second harmonic generation (SHG) imaging, counterintuitive results were observed. It was expected that the loss of crystalline order would result in a loss of second harmonic signal. Instead, there was a dramatic enhancement. It was theorized that this was an electric field induced second harmonic (EFISH) effect from electron–hole separation following hard X-ray absorption. Additional studies of amorphous vitreous solvents, which would normally be SHG inactive, generated SHG signals with spatial profiles with an EFISH mechanism. Within protein crystals, exposure to 12-keV (1.033-Å) X-rays resulted in increased SHG in the region extending ∼3 μm beyond the borders of the X-ray beam. Moderate X-ray exposures typical of those used for crystal centering by raster scanning through an X-ray beam were sufficient to produce static electric fields easily detectable by SHG. The X-ray–induced SHG activity was observed with no measurable loss for longer than 2 wk while maintained under cryogenic conditions, but disappeared if annealed to room temperature for a few seconds. These results provide direct experimental observables capable of validating simulations of X-ray–induced damage within soft materials. In addition, X-ray–induced local fields may provide evidence for additional mechanisms of resolution loss such as localized piezoelectric distortions of the lattice.



Find additional seminar information here: https://www.kecksci.claremont.edu/seminars/

Best,
Lauran Soto - Administrative Assistant (she/her)
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