

NANOSCIENCE COLLOQUIUM

Serial diffractive imaging to study nanoscale structural dynamics

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ABSTRACT : X-ray free electron lasers provide a unique opportunity to measure ultrafast, high resolution dynamics using diffractive imaging methods. In particular, I will focus on measurements on ensembles of nanosystems where the high peak brightness enables a serial (one-at-a-time) imaging approach which, when combined with modern machine learning analysis algorithms, provides much richer information than conventional ensemble measurements. Building upon our proof-of-concept studies understanding the structural landscape of gold nanoparticles, I will talk about three problems where we use this method to observe hitherto unseen properties of nanosystems, (i) large polaron formation in CsPbBr₃ quantum dots, (ii) dehydration dynamics on MS2 bacteriophage capsids using deep learning and (iii) plasmon-induced structural deformations of gold nanoparticles. Finally, I will discuss the possibility of using such an approach to observe ultrafast dynamics where precise optical triggering is not possible.

