

# Design of New Materials: Insights from In-Situ Electron Microscopy

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*In-situ* transmission electron microscopy can be used to follow the behavior and measure the properties of nanostructures over a wide range of environmental conditions with resolution down to the atomic scale. Liquid-cell electron microscopy, in particular, is the only technique that allows direct imaging of nanometer-scale processes in liquids. It has been successfully applied to imaging various processes in liquids, solutions, and colloidal suspensions that were typically investigated ex-situ on samples taken at different process stages, or in some cases in-situ using reciprocal space techniques. Here I will illustrate the power of in-situ liquid-cell electron microscopy imaging to probe complex solution-phase processes in real space. Examples include plasmon-mediated colloidal synthesis of anisotropic nanostructures and the self-assembly of nanocrystal superstructures in solution. Our results demonstrate that real-time electron microscopy can substantially advance our understanding of solution phase processes as a basis for designing materials with tailored functionality.



**Bio:** Eli Sutter is a Professor of Mechanical and Materials Engineering at the University of Nebraska-Lincoln. She received M.S. and Ph.D. degrees in Condensed Matter Physics from Sofia University “St. Kliment Ohridski” in Bulgaria. She then held postdoctoral positions at the Swiss Federal Institute of Technology (ETH Zurich) and at the University of Wisconsin-Madison. From 2000 till 2004 she was an Assistant Professor (tenure track) in Physics at the Colorado School of Mines. Before joining the University of Nebraska-Lincoln in June 2015 she spent 12 years as Scientist in the Center for Functional Nanomaterials at Brookhaven National Laboratory. Her research focuses on in-situ transmission electron microscopy of nanomaterials at variable temperatures and in different environments. She has co-authored more than 170 scientific publications and holds 8 US Patents. She received a Scientific American 50 award for Ultra-measurements (2007), the Sapphire Prize (2011) and Battelle Inventor of the Year Award (2015). She served as Chair of the International Conference on Nanoscience and Technology, Vail (CO) in 2014 and the 2017 Materials Research Society Spring Meeting in Phoenix (AZ).