

## SENIC Ambassadors Webinar Series

### Toolbox for Nucleation and Crystal Growth at Single Entity Resolutions by Controlling Nanoscale Transport

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**Abstract:** A new method named ‘NanoAC’ is developed to monitor and actively control the nucleation and crystal growth insitu at individual level, or at single entity resolution. The formation and growth of a single attoliter droplet which ultimately transforms into a single crystal, one at a time, under electroanalytical sensing together with optical imaging, is regulated under an external electrical field. The toolbox uses a quartz capillary with a single nanometer sized opening, i.e. a nanopore, to confine materials exchange between an analyte solution and a precipitating solution. Protein insulin and lysozyme are used as prototype materials system. Combined electroanalytical measurements and optical imaging provide vital feedbacks for the active control of mass transport through the single nanopore. Passive diffusion as well as active migration under an external electrical field controls the kinetics of transport and thus phase transitions. The nanopore region limits the mass exchange between internal precipitants and external sample solutions separated by this single nanopore, through which the transport of charges generates current signal as a quantitative measure. The methodology, including the measurement characteristics as feedbacks and the control of mass transport, are generalizable for other materials system. The governing mechanism is explained by the fundamental mass transport at nanometer scale interfaces.

**Bio:** Dr. Gangli Wang got his B.S. and M.S. degrees from Peking University in 1996 and 1999 respectively. He received his Ph. D. degree under the direction of Dr. Royce Murray at the University of North Carolina at Chapel Hill in 2004. After a postdoc training with Dr. Henry White at the University of Utah, Gangli started his independent career at Georgia State University in Atlanta. He is currently a full professor of chemistry. The main thrust of his research is centered at the nanoelectrochemistry regime, to gain fundamental insights for better energy and biomedical applications. The grants from NSF (CHE-1610616) and DOE (DE-SC0019043) are acknowledged.