**Growth Kinetics of Au Nanoparticles: Mean Field Modeling and SAXS.** HILMAR KOERNER, AFRL, MICHAEL TAMBASCO, Columbia Univ., ROBERT MACCUSPIE, RICHARD VAIA, AFRL, SANAT KUMAR, Columbia Univ., AFRL, WPAFB, OH TEAM, COLUMBIA UNIVERSITY, NY TEAM — Gold (Au) nanoparticles (NPs) are a mainstay of current nanoscience and technology. With such a diversity of applications, developing a better understanding of the impact of macromolecular additives on single-phase fabrication routes, and ultimately on the resultant interfacial composition and structure (size, shape and dispersity), is critical to optimize performance and lower production cost. In-situ small-angle x-ray scattering (SAXS) is uniquely situated to directly monitor the morphological evolution of Au NPs from single phase reduction of Au(I) by tert-butylamine-borane. Deconvolution of the in-situ SAXS profiles provides direct information on the evolution of NP size, polydispersity and relative number density, as well as the on-set of clustering and superstructure formation. The size-time profiles agree with mean-field calculations elucidating the role of ligands, their length and structure on the nucleation and growth kinetics as well as thermodynamic and structural characteristics of the Au NPs. In general, the combined approach provides new insights on the impact of additives on the various stages of NP formation and the ability to quantify particle-pair potentials and ascertain impact on assembly – de-assembly process of NP superstructures.

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