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Kinetics of colloidal gold nanoparticle chain assembly via *in situ* liquid cell electron microscopy observations[1] TAYLOR WOEHL, TANYA PROZOROV, Ames Laboratory, EMERGENT ATOMIC AND MAGNETIC STRUCTURES TEAM — Various types of colloidal nanoparticles are known to self-assemble into hierarchical mesostructures via anisotropic interparticle interactions. Previous modeling and experiments have suggested that dipolar interactions may be responsible for assembly of one dimensional nanoparticle chain structures; however, due to a lack of *in situ* observations little is known about the kinetics of the self-assembly. Here we use real-time nanoscale observations to measure the self-assembly kinetics of colloidal gold nanoparticles into one dimensional chains. Gold nanoparticles suspended in acetate buffer were observed via *in situ* liquid electron microscopy to self-assemble into chains of 5-10 nanoparticles over a time of minutes. Self-assembly is initiated upon irradiation of the nanoparticles with the imaging electron beam. Measurements of the self-assembly kinetics revealed that the chains formed *via* second order aggregation kinetics during the first tens of seconds. We investigate the effects of the electron beam current and ionic strength of the buffer solution on the effective aggregation rate and chain formation mechanism. Our observations suggest that the aggregation rate increases with the effective diffusivity of the nanoparticles.

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