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Watching Nanoscale Self-Assembly Kinetics of Gold Prisms in Liquids JUYEONG KIM, ZIHAO OU, Department of Materials Science and Engineering, University of Illinois, Urbana, MATTHEW R. JONES, Department of Chemistry, University of California, Berkeley, QIAN CHEN, Department of Materials Science and Engineering, University of Illinois, Urbana — We use liquid-phase transmission electron microscopy to watch self-assembly of gold triangular prisms into polymer-like structures. The in situ dynamics monitoring enabled by liquid-phase transmission electron microscopy, single nanoparticle tracking, and the marked conceptual similarity between molecular reactions and nanoparticle self-assembly combined elucidate the following mechanistic understanding: a step-growth polymerization based assembly statistics, kinetic pathways sampling particle curvature dependent energy minima and their interconversions, and directed assembly into polymorphs (linear or cyclic chains) through in situ modulation of the prism bonding geometry. Our study bridges the constituent kinetics on the molecular and nanoparticle length scales, which enriches the design rules in directed self-assembly of anisotropic nanoparticles.

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