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**Formation of three-dimensional colloidal nanoparticle supercrystals and probing the formation kinetics** IRVING HERMAN, Columbia Univeristy, CHENGUANG LU, AUSTIN AKEY, Columbia University — A multiple solvent system consisting of colloidal nanoparticles in several solvents of gradually decreasing vapor pressures was investigated in the self assembly of hundred-layer thick colloidal nanoparticle superlattices in lithographically defined capillaries. Such a solvent system allows a very slow and tunable drying rate of solvents, which, together with the microfluidic flow into the capillaries, leads to the controllable formation of large, single crystalline 3D nanoparticle supercrystals. The underlying mechanism of superlattice formation was investigated via the drying rates for nanoparticle assembly for solvent systems of specific compositions. This technique generates single-crystalline 3D supercrystals of ∼micrometer size at spatially controlled locations, and large chunks (up to 40 $\mu$m by 40 $\mu$m by 5 $\mu$m) of single crystalline supercrystals on a flat Si substrate. The ordered nature of the structures formed was probed by high-resolution SEM and small angle x-ray scattering. Insitu x-ray scattering reveals the formation kinetics of the transition of nanoparticle assemblies from amorphous to ordered. This technique is versatile and has been applied to various types and sizes of colloidal nanocrystals, including those composed of CdSe, Au, PbS and $Fe_3O_4$.

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