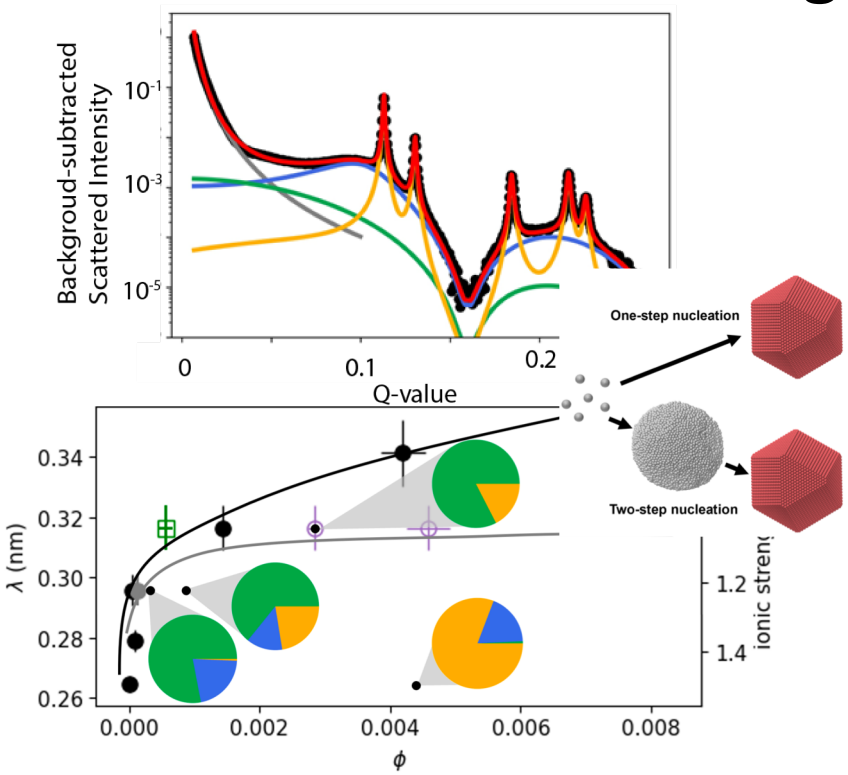
Building Materials from the Nanocrystal Up



Top: SAXS data decomposed into three nanocrystal phases—colloidal (green), liquid (blue), and superlattice (yellow)—and the quantitative fit (red) of the data (black). Bottom: Fraction of nanocrystals detected by SAXS to be in each of the three phases over time at a particular quench depth and ionic strength.

C.P.N. Tanner, V.R.K. Wall, J. Portner, A. Jeong, et al., *Nat. Phys,* **21**, 1594–1602 (2025), doi: 10.1038/s41567-025-02996-5.

Work was performed at ALS and SSRL.

Scientific Achievement

Researchers clarified the mechanism—an unusual intermediate state—that accelerates the transformation of nanocrystals into a superlattice with fewer defects using a two-step, instead of a one-step, process.

Significance and Impact

The new approach, which can control the development of materials with desired characteristics, could be applied to electronics, energy storage, and even medicine.

Research Details

- SAXS data from the Advanced Light Source and the Stanford Synchrotron Radiation Lightsource were fit to model the time-dependent evolution of three phases—colloidal dispersions, metastable liquid intermediates, and emerging superlattice.
- The self-assembly process was tuned by injecting salt solutions of different concentration into the nanocrystal suspensions.