RESEARCH INSTITUTE FOR FUNDAMENTAL SCIENCES

Frontiers of Science

Chemical Sciences Seminar Series

Lead Halide Perovskite Nanocrystals and Their Superfluorescent Superlattices

Virtual Venue: October 27 2022, 19:00 - 20:00 (GMT +3)

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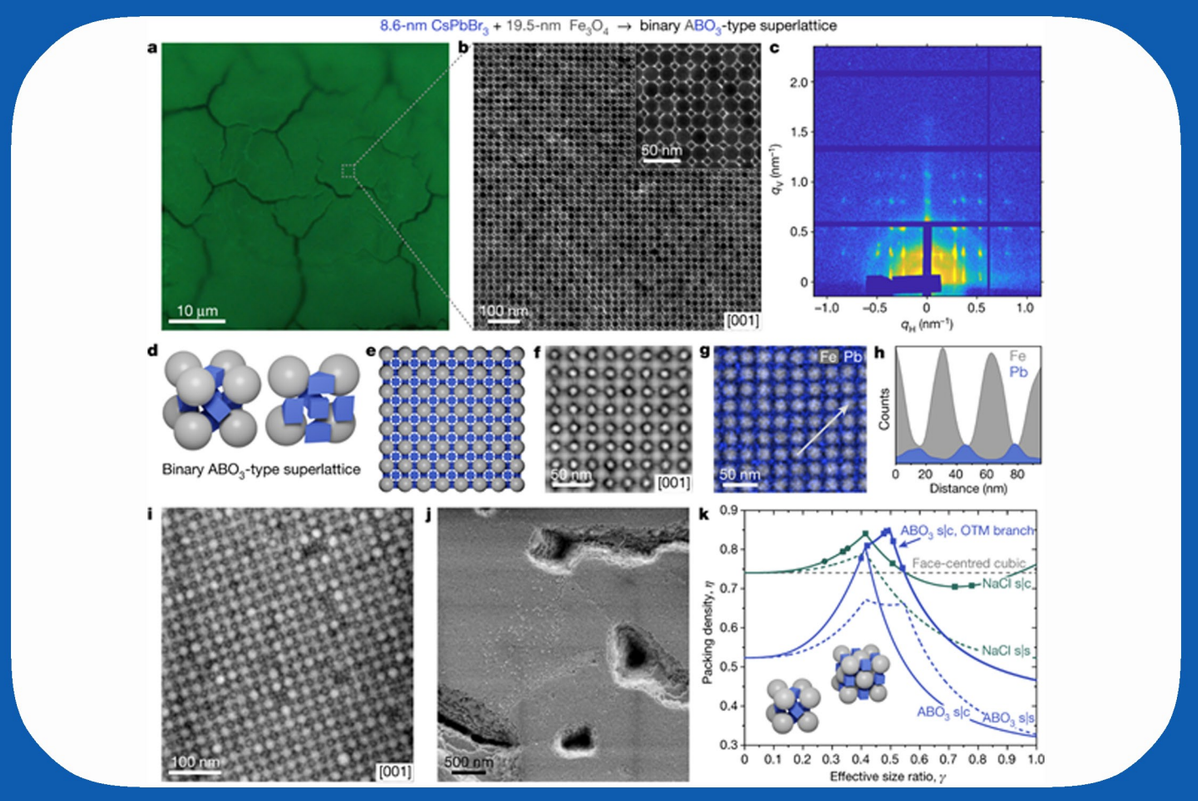

Colloidal lead halide perovskite nanocrystals (LHP NCs, formula APbX3, A=Cs+, formamidinium; X=Cl, Br, I) exhibit spectrally narrow (<100 meV) fluorescence, spanning the visible spectral range. Owing to the high oscillator strength, long coherence times of up to 80 ps and minimal inhomogeneous broadening of emission lines, these NCs make for a highly versatile platform for creating controlled, aggregated states exhibiting collective phenomena. Long-range ordered superlattices (SLs) of these NCs exhibit sharp red-shifted lines in their emission spectra and superfluorescence. Binary and ternary NC SLs can be obtained by a shape-directed co-assembly of CsPbBr3 nanocubes with spherical dielectric NCs. These mesostructures exhibit superfluorescence, characterized, at high excitation density, by emission pulses with ultrafast (22 ps) radiative decay and Burnham-Chiao ringing behaviour with a strongly accelerated build-up time. Far greater structural space, beyond the realm of known lattices, is anticipated from combining NCs of various shapes. Here, we present also on the co-assembly of steric-stabilized CsPbBr3 nanocubes with disk-shaped LaF3 NCs into binary SLs, yielding six columnar structures with AB, AB2, AB4, and AB6 stoichiometry, and several other structures not observed in all-spherical NC assemblies.