Abstract:

High-throughput design of doped colloidal nanocrystals

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Colloidal inorganic nanocrystals exhibit precise morphologies and tunable properties, making them essential components for nanoscale devices and biological imaging. Our research explores the reaction networks that govern the controlled synthesis of inorganic nanoparticles, and we investigate the photophysical networks that govern the optical properties of upconverting nanoparticles. To develop a holistic understanding of these intricate networks, we use combinatorial and high-throughput robotic techniques to map the dynamics of these networks across material compositions and reaction conditions. Using these methods, we manipulate the energy transfer pathways of lanthanide-doped upconverting nanoparticles, which combine near-infrared photons into visible light. Combinatorial screening and theoretical modeling reveal lanthanide dopant compositions that enable imaging of single upconverting nanoparticles comparable in size to fluorescent proteins and reveal nanoparticle compositions that enable excitation at wavelengths that are used to image through brain and other highly scattering media.

Bio:

Dr. Emory Chan is a Staff Scientist at the Molecular Foundry, a U. S. Department of Energy nanoscience user facility at Lawrence Berkeley National Laboratory. Dr. Chan's research interests include the combinatorial and high-throughput synthesis of semiconductor nanocrystals and lanthanide-doped upconverting nanoparticles. He received a B.S. in Chemistry from Stanford University. Dr. Chan performed his doctoral research on with Prof. Paul Alivisatos and Prof. Richard Mathies in the Chemistry department at the University of California at Berkeley. Prior to his appointment as Staff Scientist at the Molecular Foundry, Dr. Chan was a postdoc with Dr. Delia Milliron and later served on the technical staff at the Foundry.