

ICB PhD public presentations

# SOLID PHASE ION ENGINEERING IN COLLOIDAL LEAD HALIDE PEROVSKITE NANOCRYSTALS

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ICB/The Shih Group

Supervisor: Prof. Dr. Chih-Jen Shih

Co-examiners: Prof. Dr. David J. Norris and  
Prof. Dr. Andrew deMello**18/07/2023, 2 pm****ETH Hönggerberg, HCI H 2.1 and on Zoom****(<https://ethz.zoom.us/j/67097568305>)**

**Project Summary:** Colloidal metal halide perovskite (MHP) nanocrystals (NCs) have generated considerable research effort aimed at demonstrating their outstanding optical properties. The most studied compounds of this family are based on lead because of their defect tolerance. This unique property enables the NCs to possess high photoluminescence (PL) quantum yields and narrowband emission features, which allows them to be implemented into optoelectronic applications, including photovoltaics (PVs), light-emitting devices (LEDs), and photodetectors. In this presentation, I will talk about solid phase reaction engineering to tune the optical and electronic properties of colloidal MHP NCs. In the first part, I will introduce the ligand-assisted solid phase synthesis approach to synthesize NCs with color-pure electroluminescence. In the second part of the presentation, the high-entropy alloying process is demonstrated to stabilize lead-reduced MHP NCs, which is nowadays one of the biggest problem towards commercialization of these materials. In the third part, I will talk about red-emitting CsPbI<sub>3</sub> NCs and how to improve their colloidal and spectral stability by doping them with solid metal halide powder. The results presented provide an avenue to facile synthetic protocols that enable to further improve the optical properties and the colloidal stability towards highly emissive and stable perovskite QDs, which are urgently required for future photonic applications.

**CV.** Simon obtained his BSc in Chemistry from ETH Zurich, Switzerland in 2016. In 2018 he received his MSc in Chemistry also from ETH Zurich. In the same year he joined the Nanomaterials Engineering Group led by Prof. Dr. Chih-Jen Shih to start his PhD studies.