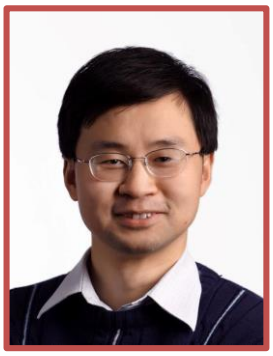
CHEMISTRY

FALL 2018 CHEMISTRY COLLOQUIA



August 31, 2018

3:15 Refreshments

3:30 Seminar
112 Hamilton Hall

Open to the public

Professor Song Jin University of Wisconsin-Madison

Crystal Growth and Optoelectronic Applications of Metal Halide Perovskite Nanostructures

The remarkable solar performance of lead halide perovskites can be attributed to their excellent physical properties that present many mysteries, challenges, as well as opportunities. Better control over the crystal growth of these fascinating materials and better understanding of their complex solid state chemistry would further enhance their applications. Here I will first report new insights on the crystal growth of perovskite materials and the solution growth of single crystal nanowires and nanoplates of methylammonium (MA), formamidinium (FA), and all-inorganic cesium (Cs) lead halides perovskites ($APbX_3$) *via* a dissolution-recrystallization pathway. Their controllable growth is rooted in our fundamental understanding of screw dislocation-driven crystal growth. Moreover, chemical strategies to stabilize the metastable perovskite phases, such as $FAPbI_3$ and $CsPbI_3$, have been developed by using surface ligands to manipulate the delicate thermodynamic and kinetic balance between 3D and 2D layered perovskites. We demonstrated high performance room temperature lasing with broad tunability of emission with these single-crystal perovskite nanowires. The excellent properties of these single-crystal perovskite nanostructures of diverse families of perovskite materials with different cations, anions, and dimensionality make them ideal for fundamental physical studies of carrier transport and decay mechanisms, and for enabling high performance semiconductor lasers, LEDs, and other optoelectronic applications.

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