**无机所学术报告**

**题目：Chemistry, Physics, and Optoelectronic Applications of Lead Halide Perovskite Nanostructures**

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**地点：化学楼A区713会议室**

**时间：2019年5月13日（周一）上午10:00—11:30**

**邀请人：李彦**

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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 (APbX3) *via* a dissolution-recrystallization pathway. We also developed the epitaxial growth of perovskite materials and 2D heterostructures with controlled phases. Moreover, chemical strategies to stabilize the metastable perovskite phases, such as FAPbI3 and CsPbI3, 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 also make them ideal for fundamental physical studies. We studied hot carrier relaxation dynamics in single-crystal APbI3 nanoplates, and excited state dynamics in 2D layered perovskites incorporating large A-site cations using femtosecond transient absorption microscopy. The results highlight the critical role A-site cations plays in the remarkable photophysical properties of perovskite materials.