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Controlling and Understanding the Origin of Free Carriers in Indium Nitride Nanocrystals[1] ZHIHUI LIU, YANG CHEN, NILADRI KARAN, REMI BEAULAC, Michigan State University, BEAULAC TEAM — Over the last decade, much interest has been devoted to nitride semiconductors such as indium nitride, InN, which has led to considerable advances in both the growth of InN and understanding of its intrinsic properties.Due to its low-energy direct bandgap of 0.7 eV, large electron affinity, ˜6 eV, large thermal and electrical conductivities and unusually small electron effective mass, InN offers tremendous potential for future optoelectronic or electronic applications. However, the growth of nanocrystalline InN still presents some important challenges, and a thorough understanding of the materials properties under quantum confinement conditions is still lacking. Because of a very large electronic affinity, InN is generally always degenerately doped, with electron concentrations that exceed 10^{20} cm^{-3}. InN nanoparticles consequently show a strong localized plasmon response absorbance in the infrared region, associated with a large density of free electrons. Exploring the properties and understanding the origin of these free electrons would be a big step forward to develop high quality intrinsic InN NCs. In this presentation, we will discuss the properties and origin of the free electrons in InN NCs. Important phenomena in InN NC as well as future study will also be discussed.

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