

## Doped Semiconductor Nanocrystal Plasmonics

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Localized surface plasmon resonance (LSPR) in doped semiconductor nanocrystals results in absorption and near field enhancement on the nanocrystal interface. This property can be tuned across a wide optical spectral range towards the infrared. Materials control can be achieved by synthetically varying doping level, and post synthetically via electrochemical control. We overview the fundamental electromagnetic dynamics governing near-field light matter interaction in plasmonic semiconductor NCs, and the realization distinctive physical properties made possible by the advancement of colloidal synthesis routes via shape and dopant control. Here, we will illustrate how free carrier dielectric properties are induced in degenerately doped metal oxides, specifically n-type impurity doped indium oxide (F,Sn:In<sub>2</sub>O<sub>3</sub>). Direct observation of infrared near-field hotspots in nanocrystal faceted corners are visualized through STEM-EELS microscopy and machine learning techniques. Furthermore, we will discuss the promise that LSPR in doped semiconductor NCs holds for a wide range of applications in infrared heat management, energy-saving smart window technology, and quantum information storage.