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Low Loss Plasmonic Oxide Nanocrystals with Controlled Morphology[1] THOMAS GORDON, TAEJONG PAIK, DAHLIA KLEIN, MATTEO CARGNELLO, CHRISTOPHER MURRAY, University of Pennsylvania — Localized surface plasmon resonance (LSPR) is a observed in metallic particles and results from the resonant oscillation of free electrons on the particle surface. One can manipulate the resonant frequencies through adjustment of the shape and size of the metal. A series of recent papers report LSPR at NIR and IR frequencies resulting from doped semiconductor nanocrystals. Free carriers in semiconductor particles result from atomic vacancies or through doping with aliovalent cations. While the plasma frequency (ω_p) is considered an intrinsic property of metals, through adjustment of dopant concentrations, ω_p can be tuned in plasmonic semiconductors, opening the possibility of producing tunable, low-loss plasmonic nanocrystals to substitute for Au and Ag. We report the size and shape controlled synthesis of plasmonic oxide nanocrystals with highly uniform morphology and shape dependent optical properties. The size, shape, and doping concentration are independently controlled by modifying the synthetic parameters, allowing for precise modulation of optical response. These nanocrystals may be assembled to form superlattices, which function as plasmonic metamaterials, or used as precursors to produce bulk like films with tunable plasma frequencies.

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