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Colloidal aluminum nanoparticles with tunable localized surface plasmon resonances for energy applications YAN CHENG, KENNETH SMITH, EBUKA ARINZE, GABRIELLE NYIRJESY, ARTHUR BRAGG, SUSANNA THON, Johns Hopkins University — Localized surface plasmon resonances (LSPRs) of noble metal nanoparticles are of interest for energy applications due to their visible and near infrared wavelength sensitivity. However, application of these materials in optoelectronic devices is limited by their rarity and high cost. Earth-abundant, inexpensive and non-toxic aluminum is a promising alternative material with a plasmon resonance that can also be tuned via size-, shape- and surface-oxide-control. Here, we employ solution-processed methods to synthesize stable colloidal aluminum nanoparticles. We systematically investigate parameters in the synthesis that control size, shape and oxidation of the aluminum nanoparticles and tune their LSPRs over the ultraviolet and visible spectral regions. We optically characterize the nanoparticle solutions and evaluate their potential for future integration into photovoltaic, photocatalytic and photosensing systems.

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