Monitoring the gold nanoshell growth mechanism: stabilizing and destabilizing effects of PEG-SH molecules.

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Streszczenie

Plasmonic nanoshells have attracted significant interest due to their resonant optical properties providing excellent spectral tunability, promising for various biophotonic applications. In this work we discuss our experimental and theoretical results related to the synthesis and optical characterization of surface-modified gold nanoshells. The nanoshell growth mechanism is monitored by IR spectroscopy, and the effects of modification of the gold nanoshell surface by PEG-SH ((11-mercaptoundecyl)tetra(ethylene glycol)) molecules are studied using TEM and optical methods. A red shift of localized surface plasmon resonance is observed upon formation of a layer of PEG-SH molecules on the completed gold nanoshells. Uncompleted gold shells show tendency to detach from the spherical silica cores, and the underlying destabilizing mechanism is discussed. The experimentally measured optical extinction properties are in good agreement with the results of numerical simulations, which additionally shed light on the localized plasmon modes contributing to the extinction, as well as on the effects of nanoshell surface nonuniformity on the resonant plasmonic properties and local field enhancements.

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