CORRELATION OF CHEMICAL AND PLASMONIC PROPERTIES OF HOLLOW AuAg NANOSTRUCTURES

Aziz Genç[§], Martial Duchamp[†], Javier Patarroyo[‡], Rafal E Dunin-Borkowski[†], Victor F Puntes[‡,⊥,‖], and Jordi Arbiol[§,‖]

[§]Institut de Ciència de Materials de Barcelona, CSIC, Campus de la UAB, 08193 Bellaterra, Catalonia, Spain

[†]Ernst Ruska-Centre for Microscopy and Spectroscopy with Electrons (ER-C) and Peter Grünberg Institute, Forschungszentrum Jülich, 52425 Jülich, Germany

[‡]Institut Català de Nanociència i Nanotecnologia (ICN2), Campus UAB, 08193 Bellaterra, Catalonia, Spain

[⊥]Vall d'Hebron Institut de Recerca (VHIR), 08035 Barcelona, Catalonia, Spain

[‖]Institucio Catalana de Recerca i Estudis Avançats (ICREA), 08010 Barcelona, Catalonia, Spain

Abstract

Metallic nanostructures have received a great deal of interest due to their unique optical properties. In particular, localized surface plasmon resonances (LSPRs) are collective oscillations of conduction electrons of a material excited by an electromagnetic wave. As a result of the localization of light at the nanoscale, far below the diffraction limit of electromagnetic waves in the corresponding dielectric medium, plasmonic nanostructures are attractive building blocks for nano optics and for novel applications in sensors, surface enhanced Raman spectroscopy (SERS), photovoltaics, superlenses, nanolasers and quantum computing.

It is well known that the LSPR properties of metallic nanostructures are affected by their size, shape, composition and environment. The ability to understand and manipulate LSPRs at the nanoscale is therefore essential to fabricate nanostructures with desired plasmonic features.

In this study, we investigate the LSPR properties of Ag-Au core-shell nanocubes and AuAg nanoboxes using low-loss electron energy-loss spectroscopy (EELS) in a monochromated scanning transmission electron microscope (STEM). We correlate the local plasmonic properties of the nanostructures with their chemistry by applying energy dispersive X-ray spectroscopy (EDX) to the same nanostructures. Our work provides an understanding of the effects of local segregation on plasmonic properties.

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