Structure-properties relationship and applications of plasmonic alloy nanoparticles obtained by laser ablation in liquid

Vincenzo Amendola

University of Padova - Dep. of Chemical Sciences, Via Marzolo 1, I-35131 Padova – ITALY

vincenzo.amendola@unipd.it

Abstract

Plasmonic alloy nanoparticles may enclose a list of appealing properties for catalysis, optics, nanomedicine and efficient exploitation of solar energy. In fact, the combination of different elements in the same metal phase is associated to a deep modification of the electronic and chemical structure of the nanomaterials. In several cases, such as the combination of traditional plasmonic elements with transition elements with catalytic and magnetic functions, thermodynamics acts against alloying and the synthesis of non-equilibrium structures is the only solution allowed. Luckily, laser ablation in liquid (LAL) emerged as a powerful technique for the synthesis of multielement nanoparticles such as metal alloys with thermodynamically forbidden composition. Here we discuss the results obtained so far with laser ablation synthesis in solution of nanoalloys with plasmonic and magnetic-plasmonic properties and how to switch from homogeneous nanoalloys to core-shell magnetic-plasmonic nanoparticles. It will be also shown how these nanoalloys resulted of interest for understanding the dependence of the localized surface plasmon resonance on the electronic band structure. Besides, we show how magnetic fields can be used to modify the interaction among magnetic-plasmonic nanoparticles or their distribution in periodic arrays of plasmonic dots.