Nanometer-sized Au nanoparticles from mono-, bi- and tri-dentate thiolate ligands

R. Zanoni,1 A. Boccia,1 L. Pescatori,2 F. Ciesa,2 A. Arduini,2 A. Pochini,2 A. Secchi,2 F. Rossi,3 V. Grillo3,4

1Dipartimento di Chimica, Universita' degli Studi di Roma La Sapienza, p.le Aldo Moro 5, 00185, Roma, Italy; 2Dipartimento di Chimica Organica e Industriale and Unità INSTM Sez. 4 – UdR Parma, Universita' di Parma, viale Usberti 17/a, 43124 Parma, Italy; 3IMEM-CNR, viale Usberti 37/A, 43124 Parma (Italy); 4Centro S3, CNR-Istituto Nanoscienze, via Campi 213/A, 41125 Modena, Italy

robertino.zanoni@uniroma1.it

Ligand-stabilized nanoparticles represent an emerging class of organic–inorganic hybrid materials, constituted by a discrete aggregate of metal atoms stabilized by a shell of organic molecules that maintain their stability in solution and prevent aggregation phenomena.[1,2] A series of gold nanoparticles (AuNPs) stabilized by monodentate, bidentate, and tridentate thiolate calix[n]arene ligands was prepared by using the Brust–Schiffrin synthesis.[3] They have been characterized by NMR spectroscopy, elemental analysis, transmission electron microscopy (TEM), and X-ray Photoelectron Spectroscopy (XPS). The experimental data reveal the electronic states of different subsets of Au atoms, and show that the particular multidentate structure of calix[n]arene derivatives introduces a control element in the preparation of the nanoparticles, which allows to obtain very small (<1 nm) nanoparticles. These experimental findings are the first which identify a role of ligand denticity in the determination of the nuclearity of nanoparticles, and open the path to a ligand-assisted synthesis in the nanometer range.

References


Figures

Figure caption