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Experiment Report Form

ESRF	**Experiment title:** XAS Characterization of Pd, Au and Au-Fe magnetic nanoparticles	**Experiment number**: CH-1968
Beamline:	**Date of experiment**: from: 23th July 2005 to: 27th July 2005	**Date of report**: 11-08-2007
Shifts:	**Local contact(s)**: Dr. Gianlucca Ciatto	*Received at ESRF:*

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Report:

Available online at www.sciencedirect.com
ScienceDirect
Acta Materialia 55 (2007) 1723–1730
Acta MATERIALIA
www.actamat-journals.com

Evolution of the microstructure, chemical composition and magnetic behaviour during the synthesis of alkanethiol-capped gold nanoparticles

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Received 18 May 2006; received in revised form 19 October 2006; accepted 22 October 2006
Available online 21 December 2006

Abstract

In the present paper, we show an exhaustive microstructural characterization of thiol-capped gold nanoparticles (NPs) with two different average particle sizes. These samples are compared with the polymer-like Au(I) phase formed as a precursor during the synthesis of the thiol-capped gold NPs. The set of analysed samples shows different microstructures at the nanoscale with different proportions of Au atoms bonded either to S or to Au atoms. It has been experimentally shown that the presence of a ferromagnetic-like behaviour is associated to the formation of NPs with simultaneous presence of Au–Au and Au–S bonds. In order to explain such magnetic behaviour a possible model is proposed based on the spin–orbit coupling so that localized charges and/or spins (Au–S bonds) can trap conduction electrons (Au–Au bonds) in orbits.

Keywords: Gold nanoparticles; Microstructure; Magnetic behaviour