

Experiment 08-01-1003, BM08

Title: Local order in composite noble-metal/magnetic nanostructures for magnetoplasmonics.

Participants: Chiara Maurizio, Valentina Mattarello

Experimental conditions: HR-XAS, heating in vacuum the sample, nominally up to 900 C

Samples:

A- Au-Co films, 30 nm and 100 nm thick, prepared by co-sputtering deposition. Heating treatments in inert atmosphere are used to test the stability of the alloy phase.

B- Au-Co arrays of nano semishells, prepared by combining nanosphere lithography, reactive ion etching and co-sputtering deposition.

Report

We could measure Au L3-edge and Co K-edge spectra of samples of class A (films of atomic composition Au₁Co₁, Au₂Co₁, Au₁Co₂, as-prepared, annealed at 200 C, 500 C and some of them at 800C) and class B (same composition as the films).

The XAS spectra were measured in fluorescence mode by a 12 elements HP Ge detector, at 80 K to limit atomic vibrations. Data quality was pretty nice in all cases. In the Figure few EXAFS spectra recorded at Co K-edge are shown for the sample whose film atomic ratio is Au/Co=2. For comparison, the spectra of a Au/Co bilayer has also been measured and reported. The analysis is in progress. Preliminary results indicate that:

- the alloy phase is very similar in the film and in the nano semishell array. It seems to be highly disordered, likely amorphous.
- The alloy phase is stable up to 100-150 C, then a phase segregation is induced.

- The Au-Co nanostructures are fully metallic, no Co-O signal is detected.

