

## Experiment HC-3491, ID26

**Title:** Role of interface in bcc-fcc phase transition of Fe nanostructures: an in-situ XAS-XES experiment.

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**Experimental conditions:** Samples placed in a furnace, in vacuum, with T controlled in the range RT-1250C. XAS spectra measured in fluorescence mode (high-energy resolution x-ray fluorescence emission) with an avalanche photodiode.

**Local contact:** Lucia Amidani

### Samples:

Samples are in form of thin Fe films (thickness 5, 10, 50, 100, 250 nm) deposited on silica by RF sputtering and then capped with a about 100 nm thick silica layer. One sample is a silica thin layer doped with bcc Fe particles, in the 5 nm range of size.

### Report

A large part of the time available has been dedicated to optimize the temperature/atmosphere parameters. Indeed, the material of the crucible released from time to time some reactive gas (likely oxygen) in standard working conditions, so that the sample and the standard Fe foil were completely oxidized. For this reason, the collected data do not constitute a very systematic series. Anyway, in the following the main results.

A picture of the oven equipped with two samples is reported, corresponding to one of the several tested configurations.

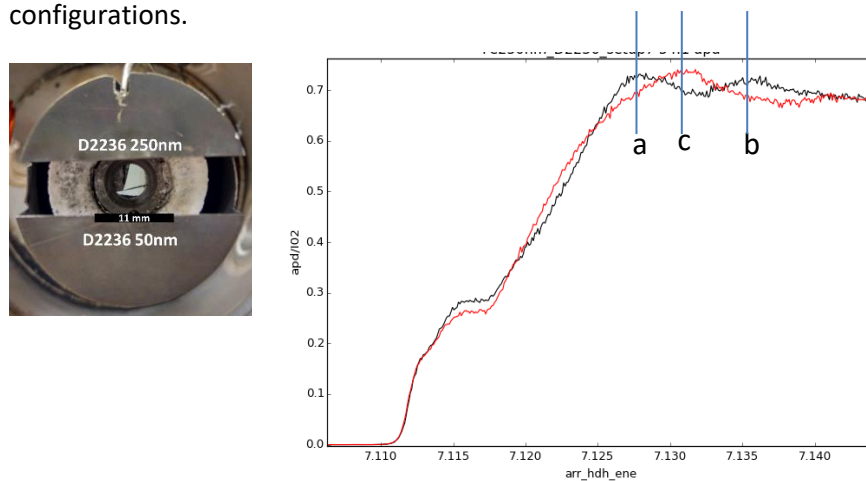


Figure 1. LEFT: One of the configurations of the oven: the reflecting surface of the two as-deposited samples is visible in the crucible. RIGHT: XANES spectra of a 250 nm Fe film collected immediately below (red line) and immediately above (black line) the bcc-to-fcc phase transition.

As preliminary test, the order parameter used to investigate the phase transition is  $p = (\mu_a + \mu_b) / 2 - \mu_c$ , with a, b and c as in Figure 1 (right). The order parameter is positive for fcc and negative for the bcc phase. Its absolute value for each phase is expected to be smaller for thinner films.

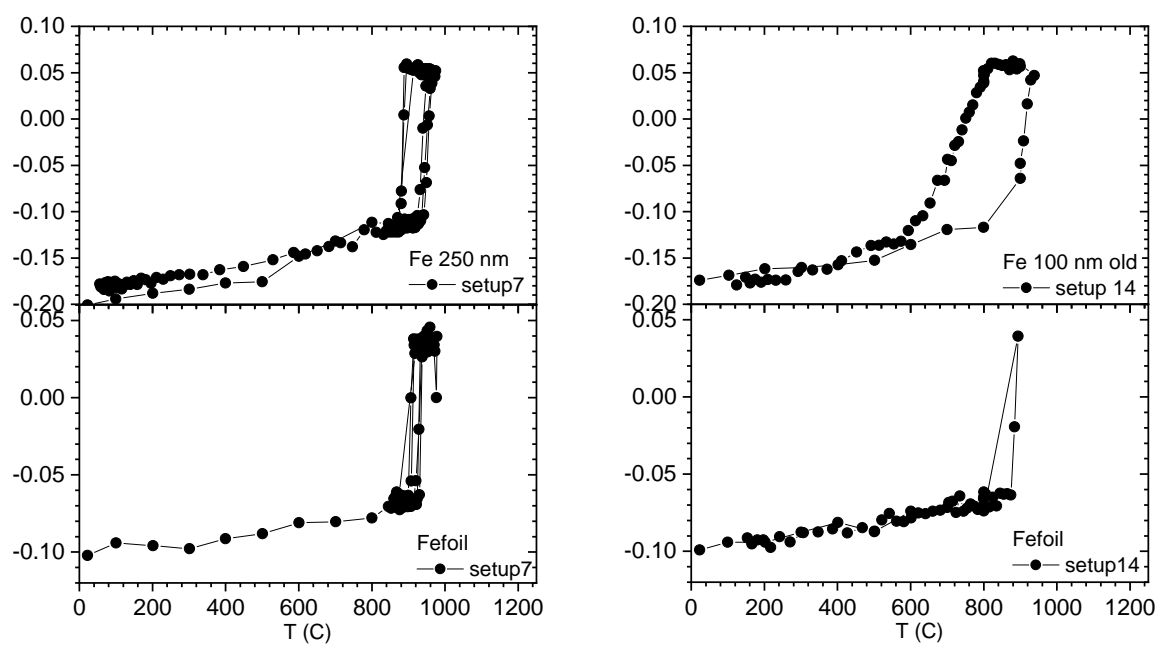


Figure 2. Order parameter  $p$  versus temperature for 250 nm thick Fe film and for a 5  $\mu\text{m}$  Fe foil (LEFT, labeled setup 7), both placed in the same crucible and for 100 nm Fe film + 5  $\mu\text{m}$  Fe foil (RIGHT, labeled setup 14).

Certainly, at least for some of the sample (among which those shown), the XANES spectra show no oxidation.

The analysis is in progress.