The aim of the experiment was to investigate the hcp (hexagonal closed-packed) - fcc (face-centered cubic) phase transition of cobalt nanoclusters in silica upon heating in vacuo: this transition, that in the Co bulk phase occurs at T=420C (at normal pressure), is expected to depend on the cluster size as well as on the cluster-matrix interaction (see the proposal for details). In Fig. 1 it is reported the grazing incidence (GI) XRD spectra of one of the investigated samples (Co nanoclusters embedded in silica, prepared by ion implantation) before and after heating in vacuo at T=900C. The comparison evidences a crystalline phase transition of the metal nanoclusters from hcp to fcc. We have observed that the transition temperature is in the range T=600-900C, that is well above that one for the bulk phase. Not all the the hcp clusters in the annealed sample undergo the transition, in fact the hcp phase is still present even after 1h annealing in vacuo. In Fig. 2 it is reported the GIXRD spectra for the annealed sample recorded at different incidence angles: an increase of the incidence angle, that corresponds to an increase of the x-ray beam penetration depth, determines an enhancement of the fcc signal with respect to the hcp one, suggesting that the hcp clusters (at least the larger ones) are likely located near the sample surface. Data processing is in progress.

A relevant part of the experimental time was dedicated to the experimental setup ad to test the furnace.

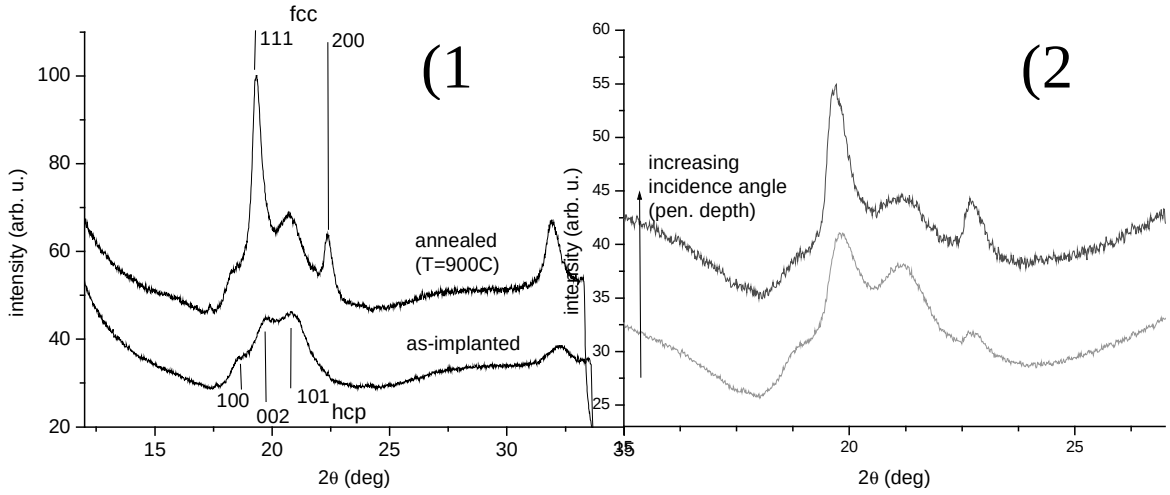

Fig. (1). Diffraction patterns from Co nanoclusters in silica before and after heating in vacuo at T=900C (λ=0.689Å).

Fig. (2). Diffraction patterns from Co nanoclusters in silica after heating in vacuo at T=900C, at two different x-ray beam incidence angles α=0.12 deg (upper) and α=0.11 deg (lower).