In the present work we focus on the combined structural-magnetic study of magnetic nanostructures with Co as the main component. Co-based magnetic nanostructures were prepared with the thermal decomposition of suitable Co-precursors in organic solutions.

This procedure leads to production of nanostructures with variable morphologies, composition and sizes. During the synthetic stage of the samples, they were exposed in atmospheric conditions so that the rate of oxidation of each sample is altered and eventually the phenomenon of exchange bias is modulated.

The preliminary structural characterization of Co magnetic nanostructures has been made with the technique of X-Ray Powder Diffraction (XRD). By studying the spectrum we determined the phases of the nanoparticles, we calculated their average size as well as the volume percentage of the components in each phase, that is to say the rate of oxidation of Co.

The study of Transmission Electron Microscopy (TEM) images and of corresponding electron diffraction patterns provided qualitative and quantitative information on the morphology, shape, size distributions and crystalline phases of the final product nanoparticles.

The magnetic characterization was performed with the study of magnetic hysteresis loops. The magnetic hysteresis loops and the curves FC-ZFC were recorded in powder samples in the temperature range 10-300 K.

Finally, an effort to combine the structural characteristics with the macroscopic magnetic behaviour of magnetic nanostructures Co was attempted. The main conclusion of this work is that the effect of enhanced magnetization is more pronounced in smaller particles than in the bigger particles. Samples comprising mainly by metallic Co present higher magnetization values, compared with nanoparticles that their surface is oxidized and presents less magnetization, a phenomenon that is strengthened while its size is decreased. On the contrary, different degree of surface oxidation leads to tuneable exchange-bias features, which are also found to be size-dependent.