STUDY OF NANOPARTICLES AND NANOWIRES BY PAC SPECTROSCOPY

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Nanoparticles, nanowires and other low-dimensional nanostructures have received considerable attention due their unique physical properties and also for their promising applications. These nanostructures have contributed to the development of emerging technologies in addition to assisting the progress of nanoscience. Nanoscience is an emerging interdisciplinary area that hopes to have broad implications in many fields such as: materials science, medicine, electronics, optics, etc. The potential applications of these nanostructures depend strongly on their quality, diameter, density, and chemical composition and their crystal structure, therefore, must be precisely controlled. However, the control of the size and morphology of nanostructured materials is not always an easy task and sometimes become challenging.

On the other hand, in order to understand the properties derived from the dimensionality of these nanosystems, different techniques have been used. The choice of each technique or methodology depends on several factors including the facility implementation on research laboratories. In this way, we believe that the analysis taking into account the correlation between different techniques would allow an improvement of the projection of future technologies. For these reason, in recent years we have carried out studies on nanostructured systems using the Perturbed Angular Correlation spectroscopy to obtain a local view of these system. Particularly, our studies have focused on Fe_3O_4 and CoO nanoparticles, which were synthesized by the thermal decomposition method. The choice of this synthesis method was due of their feasible for production in large-scale with high-quality of nanoparticles and also due of feasible to incorporate the nuclear probe. Also, we have studied hyperfine parameter of the hierarchically structured nanowires on the microtubule of ZnO and CuO obtained by thermal oxidation process by simply heating a high purity metal. These measurements are correlated with X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and magnetic measurements using a SQUID magnetometer.