

**Title:** Magnetic structures with application potential

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**Abstract:** The thesis is mainly focused on the investigation of macroscopic and microscopic magnetic properties of selected nanomaterials containing cobalt and iron, and also the capability of our new device, scanning probe microscope Multimode V by Veeco, to directly visualise morphology and magnetic structure of these samples (Magnetic Force Microscopy, MFM).

Investigated materials, such as  $\text{CoFe}_2\text{O}_4$  nanoparticles and  $\text{SiO}_2/\text{Co}/\text{Si}(111)$  thin films and multilayers are in general promising materials in many fields. In the medicine, the nanoparticles are used as the drug targets or contrast agents whereas in electronics, the (nano)granular thin films are the starting point in fabrication of high density storage media. The macroscopic magnetic properties of our samples are discussed in a view of superparamagnetic phenomena. The interactions in systems of nanoparticles are presented theoretically within the up-to date knowledge and also experimentally by demonstrating the behavior of the strongly-interacting, super-spin-glass system. The thin films are studied in term of their granular structure and magnetic anisotropy. The morphology and the microscopic domain structure, respectively, are studied with use of the MFM. The first successful results obtained in our lab by this method are presented.

**Keywords:** superparamagnet (SPM), super-spin-glass (SSG), nanoparticles, thin films, magnetic force microscopy (MFM)