"Nanoobjects microscopy"

Evaluation of the nanoparticles Fe_3O_4 and $NiFe_2O_4$ size by means of atomic force microscopy

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Topographic analysis of images derived by atomic force microscopy were used to obtain statistical data on the size of nanoparticles Fe_3O_4 and $NiFe_2O_4$. Measurements were carried out in semicontact mode, the profile of surface where nanoparticles were located was measured initially. To estimate the size of nanoparticles, the height of AFM images was used. It is possible to estimate the height of the particles quite accurately using AFM. However, because of the famous convolution effect "tip-sample" [1], visible horizontal dimensions of the particles with size of the order of the radius of curvature of the top of the needle may be substantially larger of it's real sizes. The results demonstrate that the nanoparticles are sufficiently uniform in sizes. Consequently, the Fe_3O_4 nanoparticles are more homogeneous in composition and sizes than $NiFe_2O_4$.The geometric dimensions were: for nanoparticles Fe_3O_4 – 10-40nm with a maximum density of the distribution function near 16-20nm, for nanoparticles $NiFe_2O_4$ – 130-180nm with a maximum density of the distribution function near 150nm.

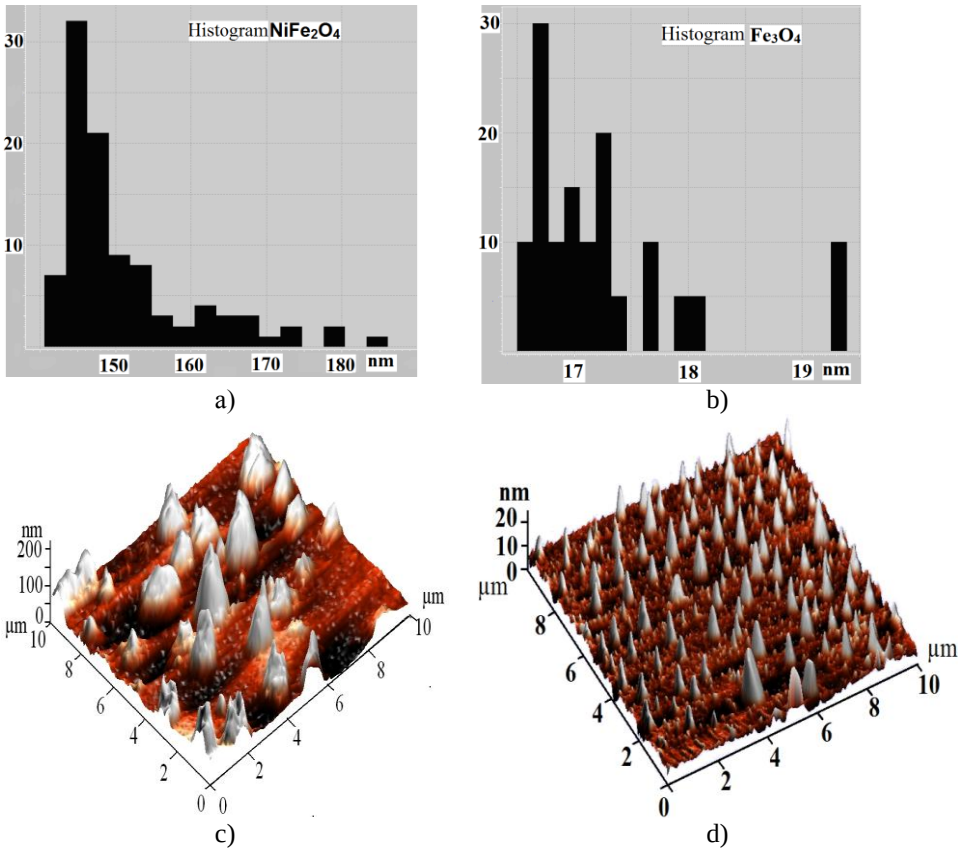

Fig. 1. a) Histogram of distribution in height for magnetic nanoparticles $NiFe_2O_4$, b) histogram of distribution in height for magnetic nanoparticles Fe_3O_4, c) 3d AFM images of $NiFe_2O_4$ magnetic nanoparticles, d) 3d AFM images of Fe_3O_4 magnetic nanoparticles.

1.V.L.Mironov, Fundamentals of Scanning Probe Microscope, The Russian Academy of Sciences Institute of Physics of Microstructures, Nizhniy Novgorod (2004) .