# Characterization of Functionalized, Magnetic Nanoparticles

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## Abstract

Nanoparticles play an important role in various fields like pharmaceuticals, advanced materials, environmental detection and monitoring. Obviously there is not a single best technique to characterize nanoparticles, but AFM is a very suitable technique offering qualitative and quantitative information on the particle.

In this study we are dealing with the characterization of iron-oxide nanoparticles. They were synthesized in a batch process based on the protocol described by Kovalenko et al [1] and shown in Figure 1 below. After particle formation the oleate shell was replaced by hydrophilic ligands. In one special case we functionalized them with a dye to create a so-called laccase sensor.

For the characterization we were interested in qualitative and quantitative information on physical properties like size, morphology and magnetic properties and statistical information on size distribution.

We will show the particle synthesis, the various functionalization products, the sample preparation for the AFM measurements and the results of the measurements.

## References

[1] Kovalenko M.V., Bodnarchuk M.I., Lechner R.T., Hesser G., Schäffler F., Heiss W., Journal of American Chemical Society **129** (2007) 6352.

## Figures

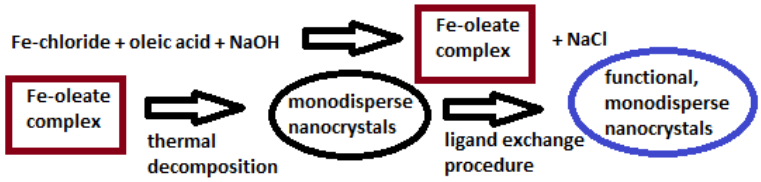


**Figure 1: Reaction scheme of the particle synthesis. These particles are characterized with AFM.**

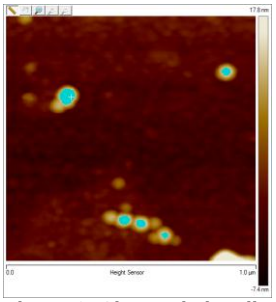

**Figure 2: Size and size distribution of particles on the example of a 1µm AFM image.**

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