

Morphological Dependence of Magnetite Nanocrystals under Different Growth Conditions

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Control of morphology, orientation and assembly properties of oxide nanostructures are of great importance for their implementation on technological devices. Chemical procedures permit the synthesis of magnetite nanocrystals in fatty acids in different morphologies depending on the number of temporary slowing-down stages.

In this work we are presenting new results concerning the synthesis base modifications for obtain of iron oxide nanocrystals. Magnetite nanocrystals growing inhibition were provided by the several modes: during reaction on the oleic acid – water solution phases (fig. 1 b, c); Fe²⁺ ions supplementary oxidation (fig. 1a); under the undecylenic acid derivatives stabilization (fig. 1d).

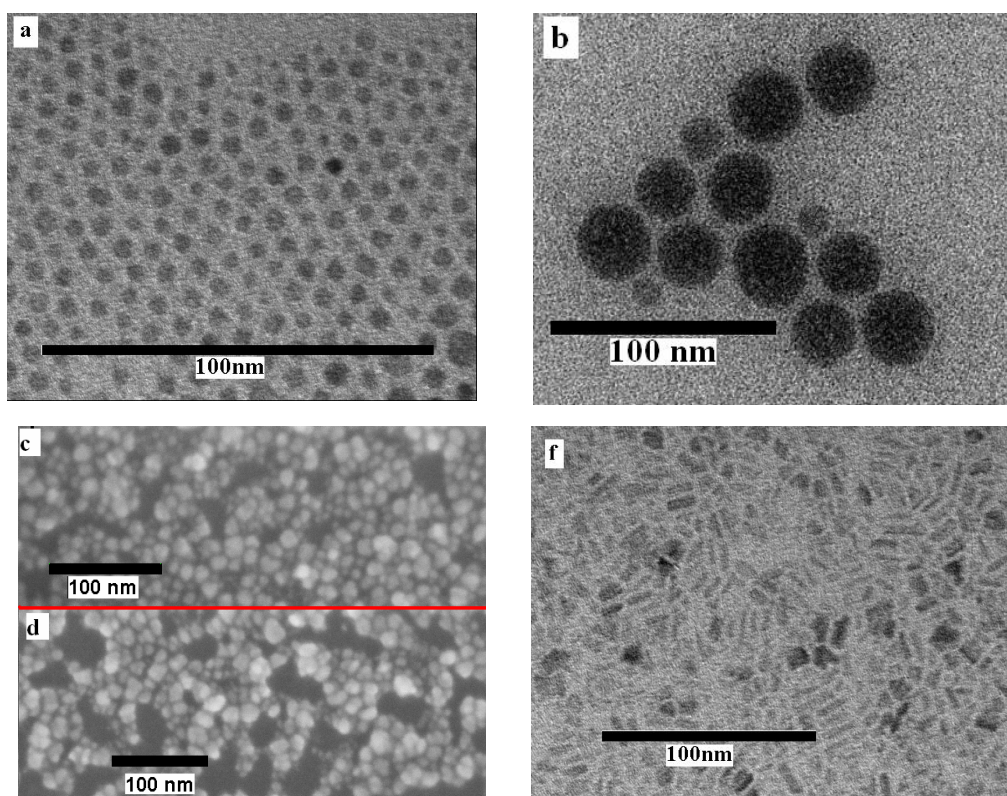


Fig. 1: TEM (a,b,f) and SEM (c,d) images of magnetite (a,b,c,f) and MnO₂ (d) nanocrystals

Crystal structure and morphology of obtained nanocrystals were characterized using TEM and SEM techniques. SEM images of oleic acid stabilized (fig. 1c) and undecylenic acid stabilized (fig. 1d) magnetite nanocrystals were identical. But undecylenic acid stabilization properties can be composed with additional oxidation during the Magnetite nanocrystals growing. Nanoparticles of MnO₂ was obtained by undecylenic acid oxidation of potassium permanganate with reaction product - 10,11 dihydroxy undecylenic acid stabilization. TEM images in fig. 1d shows planes MnO₂ nanocrystals

A reaction path with undecylenic acid derivatives stabilization is proposed which accounts the main experimental features. This leads to a better understanding of key parameters controlling the growing of nanocrystals: surface interaction, temperature variation and speed of interdiffusion.