Investigation of pore formation during the topotactic transformation from γ-FeOOH to γ-Fe_2O_3

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Lepidocrocite (γ-FeOOH, Lp) is a mineral which can be synthesized exhibiting a rod (≈10×250 nm^2) or lath shapes through oxidation of a green rust precursor [1]. Upon heating, the structure dehydroxylates topotactically to produce maghemite (γ-Fe2O3, Mh). Controlling the manner in which the heating is applied can result in a porous Mh material with varying porous characteristics, ranging from a mesoporous material to a dense one.

In this talk I will present the preparation of lepidocrocite nanorods and the study on pore formation during thermal transformation from lepidocrocite to maghemite. The porosity (pore volume, pore size and pore shape) was studied locally using scanning transmission electron microscopy (STEM-HAADF) and globally using surface adsorption and small-angle X-ray scattering (SAXS). A typical pore size that can be achieved lies around 2-3 nm, as observed with TEM although a significant fraction of the pores are closed. Analysis of nitrogen adsorption isotherms suggest that the pores are slit-shaped and are located within the nanorod.

The formation of porous iron-based structures may have potential applications in e.g., catalysis or water splitting.

[1] P.A. Kozin, G. Salazar-Alvarez, J.-F. Boily, *Langmuir* **30**, 9017-9021 (2004).