MS31.O05

In situ growth of SrFe12O19

C. Granados[1], E. Bøjesen[1], K. Jensen[1,2], M. Christensen[1]

[1]Aarhus University, Center for Materials Crystallography, Department of Chemistry & iNANO, Aarhus, Denmark, [2]Columbia University, Physics and Applied Mathematics, New York, United States

SrFe12O19 is a highly anisotropic ferrimagnetic compound with relatively high remanence and high coercivity, which is used in permanent magnets. Permanent magnets are everywhere in our daily life and they are responsible for the interconversion between motion and electricity in electrical components ranging from headphones to wind turbines. Three key parameters, important for making permanent magnets, are an anisotropic structure, size of the nanocrystallites and the microstructure. In situ X-ray powder diffraction has been used to follow the growth kinetics of SrFe12O19 under hydrothermal conditions. Synthesis of SrFe12O19 (Sr-Hexaferrite) nanocrystals by hydrothermal methods have the advantage of allowing exhaustive control of the reaction parameters. We have studied the growth and kinetics of SrFe12O19 by carring out time resolved synchrotron experiments at MAX-lab, Sweden. The experiments were carried out at elevated pressure (250 bar) and in temperatures ranging from 250 to 400 oC. The diffraction data allow us to follow the evolution of the crystallite size as function of temperature, time and composition. By controlling the composition of the precursor we can tailor the size of the nanocrystallites. The obtained data have shown that the synthesis takes place through a conversion of tiny hexagonal shaped FeOOH nanocrystallites into the SrFe12O19. Several ex situ studies under comparable conditions have been carried out to compare the magnetic properties and the obtained nanocrystallites have been investigated using high resolution laboratory powder diffraction data.

Keywords: In situ powder diffraction, Magnetism, Nanocrystallites