Structural and Magnetic Properties of Nanosized strontium Hexaferrite Powders: Experimental and theoretical investigation

B. Abraime[a, b], M. Ait Tamerd[b], A. Mahmoud[c], F. Boschini[c], A. Benyoussef[a,b], M. Hamedoun[a], Y. Xiao[d], A. El Kenz[b] and O. Mounkachi[a, *]

[a] *Materials and nanomaterials center, MAScIR (Moroccan Foundation for Advanced Science, Innovation and Research), BP 10100, Rabat, Morocco.*
[b] *LMPHE (URAC 12), Physics department, Faculty of Sciences, Mohammed V University, Rabat, Morocco.*
[c] *GREENMAT, CESAM, Institute of Chemistry B6, University of Liege, 4000 Liège, Belgium.*
[d] *Jülich Centre for Neutron Science JCNS and Peter Grünberg Institut PGI, JARA-FIT, Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany.*
*Author to whom correspondence should be addressed, email:
o.mounkachi@mascir.com, o.mounkachi@gmail.com

Strontium M-type hexagonal ferrites were synthesized at different calcination temperatures (800 °C, 1000°C and 1100 °C) using sol-gel autocombustion method. Thermogravimetric analysis (TGA), X-ray diffraction (XRD), scanning electron microscopy (SEM), Mössbauer spectroscopy (MS) and superconducting quantum interference device magnetometer (SQUID) techniques were used to characterize crystal structure, phase composition, morphology and magnetic properties. TGA gives T=800 °C as beginning of suitable calcination. Hexaferrite structure of single phase is obtained according to XRD results for all samples with crystallite size between 28 nm and 35 nm. SEM images show the growth of grain size with increasing of annealing temperature. $(BH)_{max}$ is calculated based on SQUID results and shows an enhancement between T=800°C and T= 1000°C of 25%. The magnetic properties observed at low temperature are explained and confirmed by ab-initio calculations.