

## MS41-P02 | MULTIFERROIC $\text{Bi}_2\text{Fe}_4\text{O}_9$ : TUNING OF CRYSTALLIZATION PATHWAYS AND KINETICS

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The Physical properties of many functional materials show a strong size-dependence if the material is decreased to the nanosize-regime.  $\text{Bi}_2\text{Fe}_4\text{O}_9$  shows huge distortions of the Fe-polyhedra below 122(2) nm leading the magnetic spins to rotate [1]. Its frustrated pentagonal magnetic lattice is very complex exhibiting 5 different exchange interactions and concomitant ferromagnetic and antiferromagnetic coupling in the *c*-axis and *ab* – plane, respectively [2]. A high controllability of the materials characteristics such as particle/crystallite dimensionality, crystallinity and morphology is therefore of crucial importance. The  $\text{Bi}_2\text{O}_3$  –  $\text{Fe}_2\text{O}_3$  phase system is very rich and complex since many different binary and ternary oxides tend to crystallize. In this study, we investigated how the type of complexing agent and pH change the crystallization pathways and kinetics for the  $\text{Bi}_2\text{Fe}_4\text{O}_9$  stoichiometry. In total, 25 Precursor were synthesized by a sol-gel method using the corresponding metal nitrates. Each precursor was heat treated at 873 K for 1 h and 973 K for 2 h to follow the crystallization of the  $\text{Bi}_2\text{Fe}_4\text{O}_9$  structure. The samples were analyzed by SEM, TGA/DSC, FTIR spectroscopy and in-house X-ray powder diffraction at ambient temperature and *in-situ* at high temperatures followed by Rietveld refinements. The crystallization pathways and kinetics are strongly directed by the synthesis parameters.

[1] Kirsch, A. et al. J. Phys. Chem. C, 2019, 123, 3161.

[2] Ressouche, E. et al. Phys. Rev. Lett., 2009, 103, 267204.