$EuFeO_3$ PHASE FORMATION USING THE AUTOCOMBUSTION METHOD

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The synthesis of modified iron oxides through the doping process with rare earth metals holds considerable significance across diverse applications, including photovoltaics [1], water purification systems [2], magnetic resonance imaging, targeted drug delivery, and hyperthermia [3]. In this study, we delved into the formation of the $EuFeO_3$ phase employing the autocombustion method.

The samples were prepared through the sol-gel auto-combustion method, utilizing quantities of iron and europium nitrates as the initial materials. The metal nitrates were dissolved in 20 ml of distilled water and gradually mixed under continuous stirring. Subsequently, a solution of citric acid was introduced to the solution of metal nitrates. The pH of the resulting solution was adjusted to seven by incrementally adding a 30% ammonium solution drop by drop, while maintaining constant stirring throughout the process.

The samples are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), Raman spectroscopy, energy-dispersive X-ray spectroscopy (EDX), ^{57}Fe Mössbauer spectroscopy, and X-ray absorption spectroscopy (XAS).

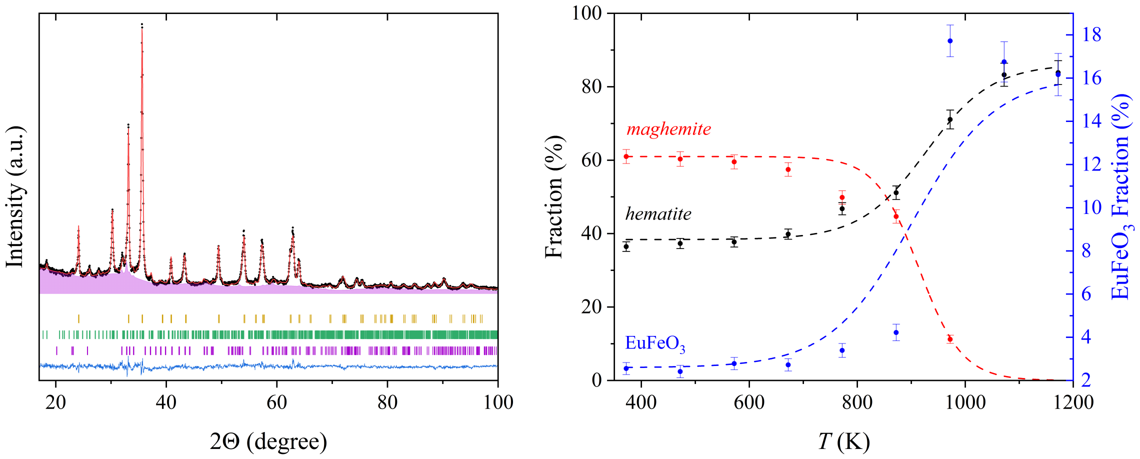

Fig. 1. XRD pattern and with Rietveld refinement for the sample $Eu_{0.2}Fe_{2.8}O_4$(left) and temperature dependences of phase composition during annealing of the same sample (right)

The outcomes suggest that an augmentation in the Eu content during synthesis results in the emergence of two fractions of $EuFeO_3$ - crystallized and amorphous. Upon annealing at 900K, the amorphous fraction undergoes a transition, transforming into a crystalline state. Furthermore, the addition of more rare earth metals leads to the formation of a larger doublet at the centre of the Mössbauer spectra and the growth of the X-ray amorphous phase.

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