

Research Visit at the Shimakawa Group, Kyoto University

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This research visit is a continuation of the work carried out during my last visit to the ICR in July 2018. This research project is possible thanks to the collaboration between Professor J. Paul Attfield (the University of Edinburgh) and Professor Yuichi Shimakawa (Kyoto University), which provided me this opportunity to collect experimental data that are essential to my research, as well as the chance to experience the life and culture of Japan.

My research interests lie in investigating the electronic behaviour of novel solid-state materials, particularly the $M\text{Fe}_3\text{O}_5$ system. During my visit in 2018, Mössbauer data were collected on CaFe_3O_5 , confirming the long-range electronic phase separation below room temperature, accompanied by spin, charge and orbital ordering. Electronic phase separation is known to be sensitive to physical and chemical perturbations, hence a close analogue to CaFe_3O_5 – $\text{CaFe}_{2.9}\text{Mn}_{0.1}\text{O}_5$ was prepared to study the effect of chemical substitution of Fe with an electronically similar element – Mn. Prior to this visit, neutron and synchrotron x-ray diffraction experiments have been carried out and showed evidence of electronic phase separation in $\text{CaFe}_{2.9}\text{Mn}_{0.1}\text{O}_5$ when it is cooled below a magnetic transition temperature of 320 K.

The aim of this research visit was to investigate the electron behaviour of $\text{CaFe}_{2.9}\text{Mn}_{0.1}\text{O}_5$ using the Mössbauer spectroscopic technique. The results of the experiment confirmed the presence of two electronically independent phases in $\text{CaFe}_{2.9}\text{Mn}_{0.1}\text{O}_5$ at base temperature, comparable to what was found in CaFe_3O_5 .

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