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Neutron scattering investigations on multiferroic materials: Advances in polarized neutron utilization

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The recent development of neutron scattering techniques, especially polarized neutron scattering utilization, will be reported with examples from the recent investigations on multiferroic materials. The recent discovery of the spin-driven ferroelectricity triggered intense exploration of new multiferroic materials and research of the novel magneto-electric effect in condensed matter. In studying these advanced functional materials, one is permanently confronted with complex spin configurations, for example, non-collinear, incommensurate magnetic structure such as helimagnetic or cycloidal spin structure as a result of frustrated magnetic interactions. Since the giant functional responses in these materials are direct consequences of these complex magnetic structures breaking the inversion symmetry, the detailed knowledge of the spin structure is mandatory to understand the essence of these advanced magnetic functional materials. More recently an electric-dipole-active magnetic excitation, often termed as electromagnon, has been observed in these multiferroic materials. The polarized neutron technique, in addition to the conventional unpolarized neutron scattering, can greatly contribute to obtain deep insight into these complex spin structures and excitations. The examples include investigations on ferroelectricity induced by a proper screw-type helical spin ordering in Ga-doped CuFeO_2 and electromagnon in the Y-type hexaferrite $\text{Ba}_2\text{Mg}_2\text{Fe}_{12}\text{O}_{22}$ with transverse conical spin structure.

Biography

Kazuhisa Kakurai has completed his PhD from TU Berlin working at the Hahn-Meitner Institut, Berlin. He joined the Institute for Solid State Physics of the University of Tokyo as an Assistant Professor and became a Professor in 1997. He was the Director General of the QuBS Directorate at the JAEA until 2014 and now serves as a Senior Consultant in the QuBS Center, JAEA.

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