582nd ASRC Seminar

Date：15：00 ～16:00, 4 February

Location：Meeting Room 103, ASRC bldg.

Speaker：Dr. Je-Geun Park

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Title：Structure and spin dynamics of multiferroic $BiFeO_3$

Multiferroic materials have attracted much interest due to the unusual coexistence of ferroelectric and (anti-)ferromagnetic ground states in a single compound. They offer an exciting platform for new physics and potentially novel devices. $BiFeO_3$ is arguably one of the most interesting multiferroic materials with both ferroelectric and magnetic transition above room temperature. Moreover, it has one of the highest polarization values, near 90 microC/cm^2. The other interest lies in the cycloid magnetic structure with an unusually long-period of 620 Å.

The key questions when it comes to the fundamental understanding of $BiFeO_3$ are how the structure evolves as a function of temperature, especially across the cycloid transition, and whether there is any structural evidence of the most sought-after magnetoelectric coupling. The other principal question concerns with a full spin Hamiltonian necessary to describe the cycloid structure and the other fascinating physical properties.

In order to answer these questions, we have carried out high-resolution structural and dynamics studies using both neutron and synchrotron facilities on powder and single crystal samples. In this talk, we will highlight the structural evidence of the magnetoelectric coupling and high-field quenching of the cycloid above 20 Tesla from high-precision neutron scattering studies [1-3]. We will also present inelastic neutron scattering data, from which we succeeded in establishing the full spin Hamiltonian [4-6].

[1] Sanghyun Lee, et al., Phys. Rev. B 88, 060103R (2013).
[2] Kenji Ohoyama, et al., J. Phys. Soc. Jpn. 80, 125001 (2011).
[3] Junghwan Park, et al., J. Phys. Soc. Jpn. 80, 114714 (2011).
[4] Jaehong Jeong, et al., Phys. Rev. Lett. 108, 077202 (2012).
[5] Jaehong Jeong, et al., Phys. Rev. Lett. 113, 107202 (2014).
[6] [Topical Review] Je-Geun Park, et al., J. Phys.: Condens. Matter 26, 433202 (2014).

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