Determine anisotropic g-tensor of rare-earth magnet using polarized neutron powder diffraction

X. Bai[1], H. Cao[2], E. Feng[3], Z. Dun[4], C. Jiang[5]

[1]No affiliation given, [2]Oak Ridge National Lab, [3]Oak Ridge National Lab, [4]No affiliation given, [5]Oak Ridge National Lab

baix@ornl.gov

Rare-earth-based quantum materials provide a rich playground for realizing exotic spin-orbital-entangled physics, such as Kitaev spin liquids. A model built from pseudo spin-1/2 operators is typically used to describe the low-energy collective physics in the rare-earth magnets. The critical link between such theoretical models and magnetic correlations observed in experiments is the effective g-tensor. Despite being a single-ion property of magnetic ion, an accurate determination of the g-tensor is not a trivial task, which often requires a combined effort of fitting bulk susceptibility, magnetization, and crystal electric field (CEF) excitations. For systems with low site-symmetry, it is particularly challenging, because the number of free parameters in the CEF model is generally greater than the number of modes observed in experiments. Polarized neutron powder diffraction is capable of probing site-dependent local susceptibility tensor, therefore provides a model-free approach for accurate determination of the ground state g-tensor. It can be applied in a wide range of rare-earth magnets and constitutes a key step toward understanding the collective physics. In this talk, I will demonstrate the this approach in the study of a Kagome-lattice spin-liquid candidate Er3Mg2Sb3O14, benefit from recent development of polarized neutron capability at the DEMAND instrument at High Flux Isotope Reactor, Oak Ridge National Laboratory.

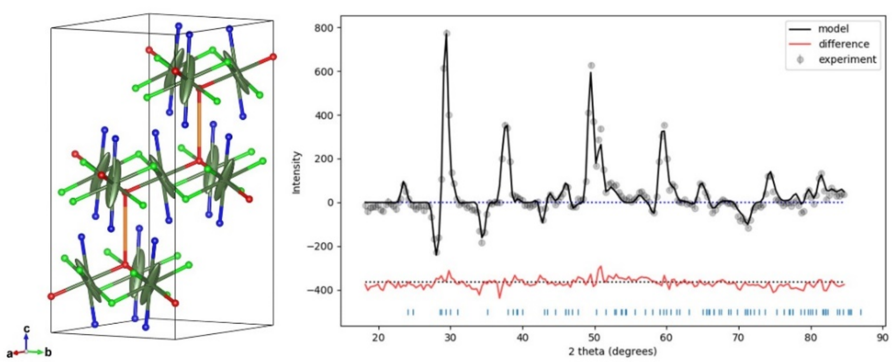

Figure 1