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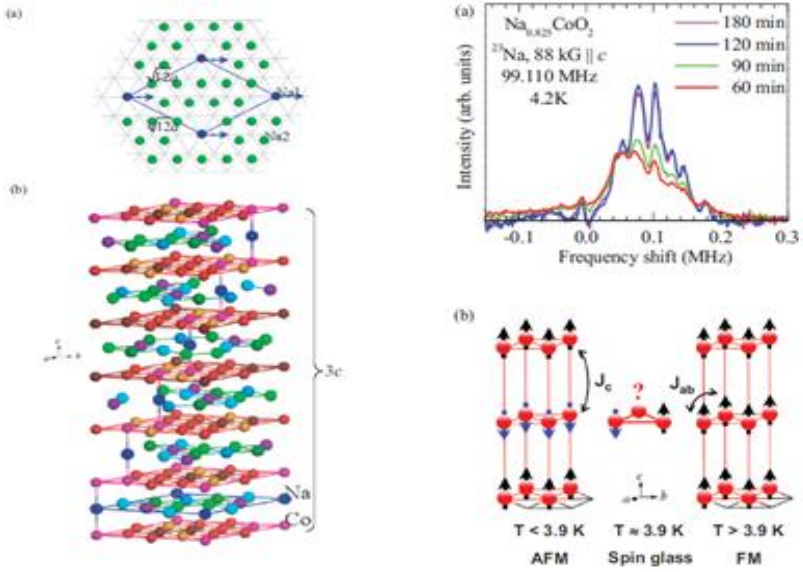
Condensed-matter physics, nuclear magnetic resonance experiment

We study the physics in a wide variety of materials, such as superconductors, magnetic materials, and topological insulators, by using nuclear magnetic resonance (NMR) techniques. In these materials, electrons with strong correlation, spin-orbital effect, and lattice coupling, often produce novel phenomena that cannot be predicted by the conventional theories. As material properties are mainly dominated by electrons, an experimental tool, such as NMR that can probe the local electron behavior directly, is required. In the past, we conducted NMR experiments to investigate the role of magnetism in an iron-based superconductor FeSe. We observed exotic magnetism in $Na_{0.825}CoO_2$ and solved its superlattice structure. We also probed the bulk electronic states in a newly-discovered topological insulator Bi_2Se_3. In the future, we plan to develop a new NMR technique so that it can probe the topological surface states of Bi_2Se_3.

Research highlights:

Cobalt magnetism in a superstructured metallic antiferromagnet $Na_{0.825}CoO_2$ [PRB 88, 064418 (2013)]



Probing the bulk electronic states of Bi_2Se_3 using nuclear magnetic resonance [PRB 86, 075137 (2012)]