Surface and bulk electronic structure and magnetism of lanthanide compounds probed with photoemission

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Photoemission spectroscopy is one of the most direct and powerful methods of studying the electronic structure of solids. By measuring the kinetic energy and angular distribution of the electrons photoemitted from a sample, one can obtain detailed information on both the energy and momentum of the electrons propagating inside a crystalline material. This is of high importance for uncovering the relation between electronic, magnetic, and chemical properties of solids. Also complementary information on the atomic structure can be obtained by analyzing angular distributions of core-level photoelectrons obtained from photoelectron (PED) diffraction measurements.

Here, we use photoemission spectroscopy to study the electronic structure, magnetism and related properties of layered crystals of lanthanide compounds LnT_2X_2, where Ln is a rare-earth element, T = Rh, Ir or Co, and X = Si or P. Some of these materials exhibit strongly correlated electronic behavior and unusual magnetic properties. Our results demonstrate the capabilities of various photoemission techniques to reveal the features of the electronic and spin structure of quantum materials, including bulk and surface electronic states, spin-orbit interaction effects, electron-boson interactions, changes in the valency of 4f elements, differences in the magnetic properties of the surface layers from the bulk ones, variations of the crystal field near the surface that leads to changes in the direction of 4f magnetic moments[1-4].

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Bibliography

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