Universität Münster

Aktuelle Fragen
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Excitations in Altermagnets and Antialtermagnets

© Prof. Dr. Alexander Mook

Prof. Dr. Alexander Mook
Institut für Festkörpertheorie
Universität Münster

Altermagnets and antialtermagnets are a recently identified class of magnetic materials that challenge the traditional dichotomy between ferro- and antiferromagnets. Although their net magnetization vanishes, their symmetry allows for momentum-dependent spin splitting and other unconventional magnetic responses, placing them in an intriguing middle ground between well-established magnetic phases.

In this talk, I will explore how these unusual symmetry properties manifest themselves in the collective excitations of altermagnets and antialtermagnets. I will start by showing how altermagnetism can naturally emerge from orbital ordering, providing a microscopic route to altermagnetic behavior, as illustrated in the figure. I will then introduce the recently predicted spin-demon mode in a d-wave altermagnet, which represents a qualitatively new type of collective excitation enabled by altermagnetic symmetry.

Next, I will discuss the dynamics of magnons in altermagnets such as hematite, and show that they are generically unstable quasiparticles: spin-split magnon bands open up decay channels that lead to spontaneous magnon decay even at zero temperature. I will further demonstrate how coupling between magnons and phonons can imprint altermagnetic symmetry onto the lattice degrees of freedom, resulting in a characteristic ddd-wave texture of phonon angular momentum.

If time permits, I will conclude with a brief outlook on antialtermagnets, highlighting odd-parity spin splitting of magnons and showing how altermagnetic symmetries can even emerge at antiferromagnetic surfaces.