Chiral magnons and anisotropic damping in metallic g-wave altermagnets

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In altermagnets, the chiral magnon degeneracy of antiferromagnets is lifted along certain wave-vector directions and chiral magnons emerge as a consequence of exchange interactions and crystal symmetry, rather than from spin-orbit coupling. Unlike chiral magnets, where chirality originates from the Dzyaloshinskii-Moriya interaction in noncentrosymmetric systems, altermagnetic chiral magnons arise from the momentum-dependent spin splitting enforced by symmetry, even in centrosymmetric materials. In this presentation, results are presented of our recent investigation [1] on the interplay between electronic band spin splitting and chiral magnon excitations in a series of metallic g-wave altermagnets of 3*d*-transition-metal pnictides, TmPn, in the NiAs structure with a 3*d* element (Tm=V, Cr), and a pnicogen (Pn= As, Sb, Bi) using density functional theory and many-body perturbation theory [2]. The latter theory allows a coherent investigation of Stoner and magnon excitations. For example, we find that the magnon damping due to Stoner excitations is highly wavevector-dependent, reaching substantial values in specific Brillouin zone regions. Among the compounds studied, CrSb exhibits the strongest chiral magnon band splitting. Recent RIXS experiments [3] on CrSb confirmed the presence of polarization-dependent magnon modes but lacked the energy resolution necessary to resolve the theoreticallypredicted 52 meV magnon splitting. In contrast, inelastic neutron scattering (INS) provides both the momentum and energy resolution required to test these predictions, however the magnon energy might be a bit too high for neutron scattering. Furthermore, our calculations reveal that VSb hosts low-energy chiral-split magnons (with energies up to 80 meV and a splitting of approximately 40 meV), placing them well within the detection range of modern INS techniques.

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[2] E. Sasioglu, *et al*., Phys. Rev. B 81,054434 (2010).
[3] N. Biniskos, *et al*., arXiv:2503.02533 (2025).