

Magnons, Magnon Polarons and Spin-Entangled Optical Resonances in Semiconducting van der Waals Antiferromagnets

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Two-dimensional materials provide a rich platform for exploring the distinctive electronic, optical, and magnetic properties of low-dimensional systems. Among them, van der Waals (layered) magnets—particularly the family of metal phosphorus trichalcogenides (MPX₃, where M = Mn, Fe, Co, Ni; X = S, Se)—have recently reignited significant research interest. MPX₃ compounds are semiconducting antiferromagnets that exhibit a variety of spin-ordering patterns.

The properties of these materials will be discussed in view of magneto-spectroscopy studies—including Raman scattering, far- and near-infrared optical spectroscopy, and electron paramagnetic resonance—of several representative layered antiferromagnets: MnPS₃, MnPSe₃, FePS₃, FePSe₃, NiPS₃, and CoPS₃. The focus will be on identifying distinct magnon-gap excitations, probing magnon-phonon coupling, and exploring the origin of spin-entangled optical transitions observed in selected members of the MPX₃ compounds.

References:

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