

Field-Tuned Excitons & Magnons in CrSBr

Aleksandra Lopion¹, Pierre Piel¹, Rafał Komar², Jan-Hendrik Larusch¹, Florian Dirnberger³, Nicolai-Leonid Bathen¹, Marie-Christin Heißenbüttel¹, Zdenek Sofer⁴, Tomasz Kazimierczuk², Ursula Wurstbauer¹

¹Institute of Physics, Münster University, Münster, Germany. ²Faculty of Physics, University of Warsaw, Warsaw, Poland. ³Physics Department, TUM School of Natural Sciences, Technical University of Munich, Munich, Germany. ⁴Department of Inorganic Chemistry, University of Chemistry and Technology Prague, Prague, Czech Republic

Abstract

CrSBr's quasi-1D electronic structure hosts excitons whose energies shift with ferromagnetic versus antiferromagnetic interlayer alignment, directly linking its optical and magnetic orders. Low-temperature magneto-photoluminescence and reflectance reveal that different excitonic states show distinct magnetic tunability. Resonant Raman scattering uncovers two high-energy features that track the crystal's triaxial anisotropy, which theory identifies as low-momentum magnons. Together, these results highlight strong exciton-magnon coupling via spin-selective interlayer exchange, offering new routes to hybrid quasiparticles in 2D magnets.