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# Exciton-Coupled Coherent Magnons in a 2D Semiconductor

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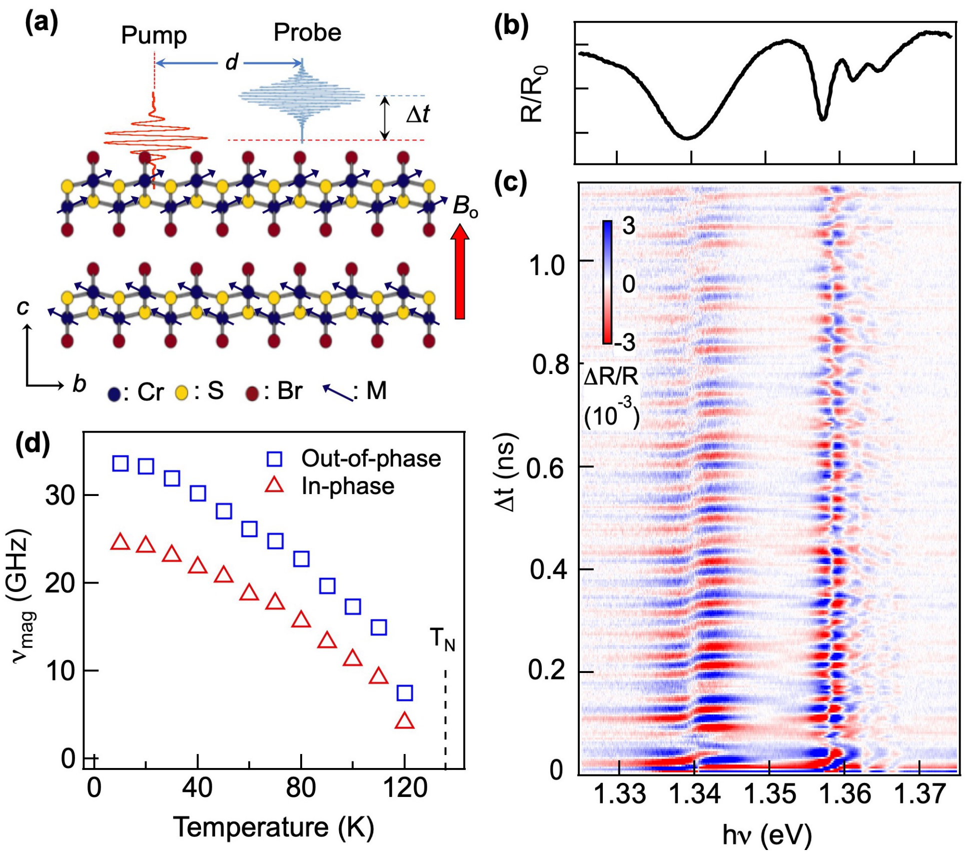
One exciting application of magnetic materials is the use of coherent magnons as energy-efficient information carriers in spintronics and magnonics or as interconnects in hybrid quantum systems. A particular opportunity arises when the magnet is also a semiconductor that features both tightly-bound excitons with large oscillator strength and potentially long-lived coherent magnons due to the bandgap and spatial confinement. While magnons and excitons are energetically mismatched by orders of magnitude, their coupling can lead to efficient optical access to spin information. Here we show strong magnon-exciton coupling in the A-type antiferromagnetic semiconductor CrSBr. Coherent magnons launched by above-gap excitation modulate the exciton energies. Time-resolved exciton sensing reveals magnons that can coherently travel beyond 7 μm, with coherence time above 5 ns. We observe this exciton-coupled coherent magnons in both even and odd number of layers, with and without compensated magnetization, down to the bilayer limit. Given the versatility of vdW heterostructures, these coherent magnons may be basis for optically accessible spintronics, magnonics, and quantum interconnects




**Exciton coupling to coherent magnons in CrSBr**. (a) Pump-probe detection coherent magnons from excitonic resonances. (b) Reflectance spectrum from CrSBr (c) Transient reflectance spectra ΔR/R as a function of pump-probe delay (Δt) and probe photon energy (*hv*) at 5 K. (d) The two magnon frequencies as a function of temperature.