

Epitaxial Pyrochlore Oxide Thin Films as a Platform for Emergent Magnon Transport Phenomena

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The observation of the magnon Hall effect in magnetic pyrochlore oxides has revealed rich Berry-phase magnon physics in geometrically frustrated magnets [1,2]. However, studies so far on these systems have been limited to bulk samples, constraining exploration of dimensionality effects, interfacial phenomena, and heterostructure engineering.

Here, I present a just launched ERC-funded research project to develop epitaxial thin films of pyrochlore magnets.

Stabilizing the complex pyrochlore structure ($A_2B_2O_7$) presents significant materials chemistry challenges due to the need for precise oxygen stoichiometry, cation ordering, and lattice matching. In particular, I will discuss strategies for developing macroscopic ceramic targets and structurally-compatible buffer layers to enable the epitaxial growth of these magnetic pyrochlore oxides.

By extending magnon Hall physics into the thin film domain, we aim to establish pyrochlore oxides as a versatile platform for exploring spin-orbit-coupled magnon transport, thermal spin transport, and frustrated magnetism in reduced dimensions, including thickness-dependent transport and strain-tuned magnetic interactions.

References

- [1] Y. Onose et al., *Science*, 329 (2010) 297
- [2] T. Ideue et al., *Physical Review B*, 85 (2012) 134411

Figures

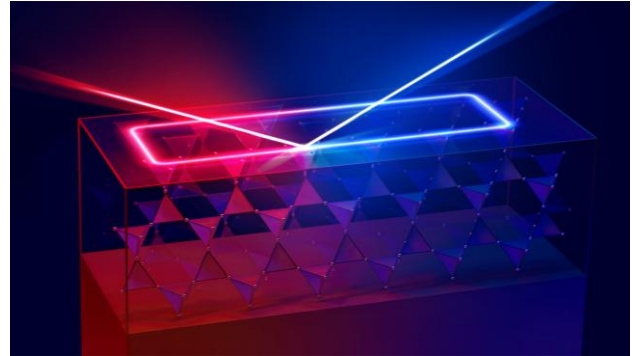


Figure 1: Artistic sketch of a pyrochlore lattice embedded in a thin-film heterostructure
