Interfacial Coupling of Anomalous and Planar Hall Effects in SRO/NiO Bilayers

Scientific Achievement

A CINT User Team used coupling of anomalous and planar Hall effects in SRO/NiO bilayers to produce asymmetric hump–dip features driven by interfacial microstructure, spin disorder, and modified magnetic anisotropy beyond conventional interpretations.

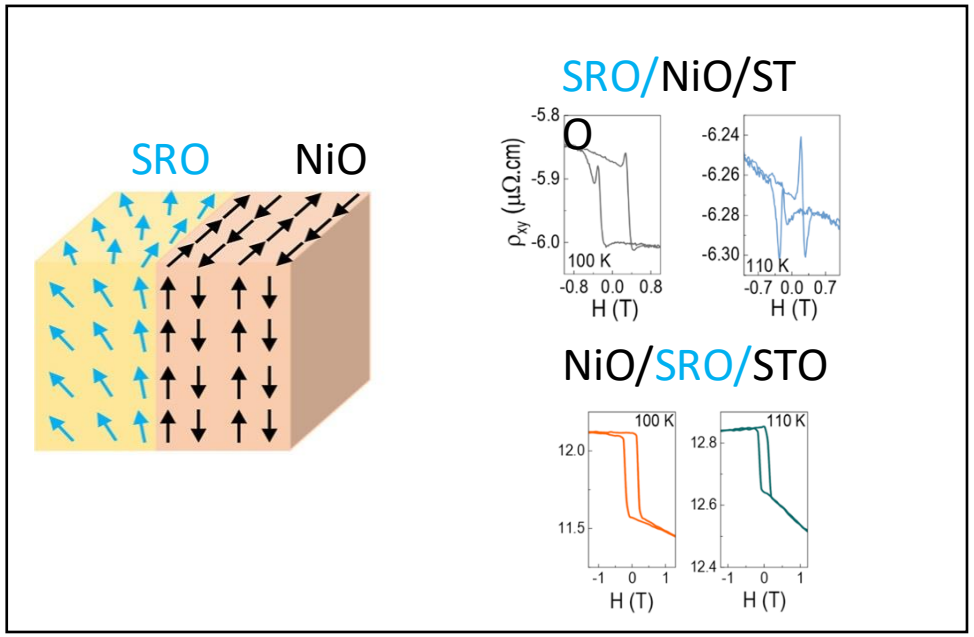

Figure: Left: Magnetic disorder formed in SRO when it was grown on top of NiO nanoparticles. Right: (top panel) Experimental Hall resistivity of the **SRO/NiO**/STO heterostructures measured at 100 and 110K. (bottom panel) Hall resistivity of the **NiO/SRO**/STO heterostructures.

Significance and Impact

These findings clarify interfacial control of magnetotransport in oxide heterostructures, enabling design of spintronic devices by exploiting coupled Hall effects and anisotropy engineering in ferromagnet–antiferromagnet systems for advanced device applications.

Research Details

- Thin films of $SrRuO_3$ (SRO) and NiO were grown on $SrTiO_3$ (STO) using pulsed laser deposition.
- Demonstrated the effect of interfacial microstructures in magnetization behavior.

Work was performed, in part, at the Center for Integrated Nanotechnologies.

Roy, P.; Zhang, D.; Cucciniello, N.; Kunwar, S.; Chen, A.; Jia, Q. Coupling of Anomalous Hall and Planar Hall Effects in Ferromagnet/Antiferromagnet Bilayers. *ACS Applied Electronic Materials,* 2026