UNIVERSITÄT BIELEFELD

Fakultät für Physik

Physikalisches Kolloquium

Prof. Satoru Emori

Virginia Polytechnic Institute and State University

Pumping Iron (and Nickel): Magnetic Damping and Spin-Orbit Torque in Vertically Graded FeNi Alloys

Energy-efficient spintronic devices require a large spin-orbit torque (SOT) and low damping to excite magnetic precession. In conventional devices based on heavy-metal/ferromagnet bilayers, reducing the ferromagnet thickness to ~1 nm enhances the torque – but dramatically increases the damping.

I will present my team's new approach toward attaining low damping *and* a sizable SOT in single-layer, 10-nm-thick FeNi alloys. A vertical Fe:Ni compositional gradient is designed to provide the necessary asymmetry for SOT generation. We confirm low effective damping in FeNi even with a steep compositional gradient. More remarkably, we reveal a sizable anti-damping SOT even *without* any intentional compositional gradient. Through noninvasive depth-profile measurements, we identify a lattice strain gradient as the key asymmetry giving rise to the SOT. Our findings provide fresh insights into damping and SOTs in single-layer ferromagnets for power-efficient spintronic devices.

Tuesday, July 9, 2024, 4:15 p.m.

H6