Abstract Submitted
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Scaling of the Anomalous Hall Effect in the Low Conductivity Regime[1] FRANCES HELLMAN, UC Berkeley Physics Department, JULIE KAREL[2], UC Berkeley Materials Science and Engineering Department, CATHERINE BORDEL, SIMCA BOUMA, HYEON-JUN LEE, UC Berkeley Physics Department, MATERIALS SCIENCE DIVISION, LAWRENCE BERKELEY NATIONAL LAB TEAM — Temperature-dependent resistivity, magnetization, magnetoresistance and Hall effect were measured in amorphous and epitaxial Fe_xSi_{1-x} ($0.43<x<0.71$) thin films. The resistivity increases as x is decreased, and changes in the temperature coefficient of resistivity (α) are observed with variation in both structure and composition. All films are ferromagnetic and display an anomalous Hall effect (AHE). AHE of the amorphous films is 10 times larger than crystalline films of the same composition. The epitaxial films display a scaling behavior consistent with the intrinsic AHE mechanism. The AHE in the low conductivity regime (amorphous films) shows a scaling with conductivity similar to that seen in low conductivity GaMnAs films despite much larger disorder and carrier concentration in the amorphous films. Amorphous Fe_xSi_{1-x} in this range of x however is notably not in the insulating hopping regime but is instead a strongly disordered metal, a regime that lacks theoretical understanding of AHE.

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