

Abstract Submitted
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Emergence of magnetic order in ultra-thin pyrochlore iridate films¹ SURAJ CHEEMA, CLAUDY SERRAO, JULIA MUNDY, SHREYAS PATANKAR, ROBERT BIRGENEAU, JOSEPH ORENSTEIN, SAYEEF SALAHUDDIN, RAMAMOORTHY RAMESH, Univ of California - Berkeley — We report on thickness-dependent magnetotransport in (111) - oriented $\text{Pb}_2\text{Ir}_2\text{O}_{7-x}$ (Pb227) epitaxial thin films. For thicknesses greater than 4 nm, the magnetoresistance (MR) of metallic Pb227 is positive, linear and non-saturated up to 14 T. Meanwhile at 4 nm, the conduction turns nonmetallic and the MR becomes negative and asymmetric upon field-cooling; such traits are reminiscent of all-in-all-out (AIAO) magnetic order in the insulating pyrochlore iridates. Hysteretic low-field MR dips and trained-untrained resistivity bifurcations suggest the presence of magnetic conducting domain walls within the chiral AIAO spin structure. Beyond just AIAO order, angular-dependent MR indicates a magnetic phase space hosting 2-in-2-out (2I2O) spin ice order. Such anomalous magnetotransport calls for re-evaluation of the pyrochlore iridate phase diagram, as epitaxially strained Pb227 exhibits traits reminiscent of both the insulating magnetic and metallic spin-liquid members. Furthermore, these results open avenues for realizing topological phase predictions in (111) - oriented pyrochlore slabs of kagome-triangular iridate heterostructures.

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