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WITHDRAWN Spin-orbit coupled double perovskite bilayers: Magnetism, Chern bands, and quantum anomalous Hall insulators on the honeycomb lattice

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Spectacular experiments have demonstrated the controlled layer-by-layer growth of oxide heterostructures. This leads to the exciting prospect of tuning magnetism and topological states of correlated electrons in low dimensions. Here, we model $\{111\}$-grown bilayers of spin-orbit coupled double perovskites such as Sr_2FeMoO_6, showing that these buckled honeycomb materials act as half-metallic ferrimagnetic films. The combination of inter-orbital hybridization and symmetry-allowed trigonal distortion leads to a rich phase diagram with tunable magnetization directions, topological $C = \pm 1, \pm 2$ Chern bands, and a $C = \pm 2$ quantum anomalous Hall insulator regime.
An effective two-band model of Zeeman-split $j = 3/2$ states captures this emergence of $C = \pm 2$ band topology.

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