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New Magnetic State In Thin-Film Antiferromagnets and Uncompensated Magnetization[1] IGOR V. ROSHCHIN, K.E. BADGLEY, Texas A&M University, K.D. BELASHCHENKO, University of Nebraska-Lincoln, MIKHAIL ZHERNENKOV, MICHAEL R. FITZSIMMONS, Los Alamos National Laboratory — We observe a new magnetic state, for which the origin (M(H=0)=0 point) is outside the major hysteresis loop, which means that zero magnetization at zero applied field cannot be reached isothermally. We observe this in antiferromagnet-only, (110)-FeF_2 grown on MgF_2, samples. The surface is responsible for the macroscopically broken time-reversal symmetry, uncompensated magnetization (UM) in a nominally compensated antiferromagnet, and, ultimately, for the new magnetic state. We argue that it is an equilibrium state. Magnetometry and polarized neutron reflectivity (PNR) measurements indicate that the UM is present in this AF. We report rather unusual properties of this UM, including the "intrinsic exchange bias." While its manifestation in a shift of the hysteresis loop is similar to that of the "classical" exchange bias observed in bilayers, here, it is observed in a single layer material. We discuss the implications of the origin of the UM on the exchange bias mechanism.

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