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Weak ferromagnetism in a high-pressure phase of $FeTiO_3$ with polar lattice distortion[1] TAMAS VARGA, JOHN MITCHELL, Argonne National Laboratory, CRAIG FENNIE, Cornell University, STEPHEN STREIFFER, SEUNGBUM HONG, MOONKYU PARK, Argonne National Laboratory, VENKATRAMAN GOPALAN, AMIT KUMAR, EFTIHIA VLAHOS, Pennsylvania State University, TAKESHI SANEHIRA, YANBIN WANG, University of Chicago — Today's challenge in multiferroics is to identify materials in which polarization and magnetization – normally considered contraindicated properties - are strongly coupled. Recent density functional theory calculations have predicted that the family of compounds $MTiO_3$ (M = Mn, Fe, Ni) are promising candidates where a polar lattice distortion can induce weak ferromagnetism. The crucial insight is that while the equilibrium one-atmosphere structure of these is ilmenite, they must be transformed to a closely related $LiNbO_3$-type structure. We have prepared the corresponding $FeTiO_3$ phase at 18 GPa and 1200 °C. It shows a sharp antiferromagnetic (AF) transition at 111.5 K. $FeTiO_3$ also displays ferroelectric domains, and weak ferromagnetism coincident with the AF transition. Possible coupling between its polarization and weak ferromagnetism is discussed based on results of piezoelectric force microscopy (PFM), second harmonic generation (SHG), dielectric, and polarization measurements.

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