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The origin of the double-triangle hysteresis loops in $ErFeO_3$ near the low temperature erbium ordering transition L.T. TSYMBAL, O. Galkin Donetsk Physics & Technology Institute, YA. B. BAZALIY, Universtiy of South Carolina and Institute of Magnetism, Kyiv Ukraine, G.N. KAKAZEI, Universidade do Porto, Porto, Portugal and Institute of Magnetism, Kyiv Ukraine — Magnetic properties of an orthoferrite $ErFeO_3$ are determined by the iron and the rare-earth magnetic ions. Interactions between magnetic sub-systems of $ErFeO_3$ lead to a sequence of orientation phase transitions observed in this material. In this work hysteresis loops in single crystal $ErFeO_3$ samples were studied below the spin-rotation transition region, $T < 80$ K. Above and around the compensation point $T_{\rm comp} = 46$ K the hysteresis loops are rectangular, with the coercive force diverging at T_{comp}. As the temperature is lowered towards the erbium ordering transition $T_{N2} = 4.1$ K, the shape of the loops experiences a dramatic change. At 20 K the loops develop triangular "tails." At 10 K the triangles become prominent while the central rectangular part near $H = 0$ collapses. A double-loop hysteresis pattern with two triangular loops emerges. We explain this behavior by a domain wall motion reversal mechanism with negligible pinning of the walls in the sample. The transition from the rectangular to the double-triangle loops is due to the competition between the energy barrier of wall nucleation and the demagnetization energy gain achieved by placing the wall inside the sample. Our model explains well the correlation of the loop's shapes and sizes with the total magnetization of $ErFeO_3$.

Yaroslaw Bazaliy
University of South Carolina

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