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Hysteretic phenomena in multiferroic HoMnO₃ EDUARD GALSTYAN, BERND LORENZ, TcSUH, University of Houston, MARIN GOSPODINOV, Institute of Solid State Physics, Bulgarian Academy of Science, KAREN MARTIROSYAN, Chemical Engineering, University of Houston, PAUL CHU, Hong Kong University of Science and Technology, TcSUH, Lawrence Berkeley National Laboratory — The hexagonal HoMnO₃ is multiferroic with ferroelectric transition at $T_C=875$ K, the Mn³⁺ moments order at $T_N=72$ K, Mn³⁺- spin reorientation transitions occur at $T_{sp1}=34$ K and $T_{sp2}=4.9$ K, and magnetic Ho³⁺ orders at $T_{Ho} \sim 5.2$ K. Our dc susceptibility measurements of HoMnO₃ single crystal under both zero-field cooled (ZFC) and field-cooled (FC) conditions at low applied magnetic fields reveal an unusual anomaly. In particular, below 4.9 K, the out-of-plane susceptibility (*c*-axis magnetization) is higher in the case of a ZFC measurement compared with that of a FC measurement. Above 4.9 K, the ZFC curve is lower than the FC curve, as well as for the in-plane susceptibility measurement in the temperature range below $T_N=34$ K. We assume that these phenomena are related to the magnetic and ferroelectric domain boundary structures and sensitively respond to changes of the magnetic structure such as spin-rotations at the phase transitions. We also have observed a sizable difference in the magnetization of HoMnO₃ polycrystalline samples with nano and micro size particles.

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