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Unusual temperature dependence of the magnetic anisotropy constant in barium ferrite $BaFe_{12}O_{19}$ FAN ZHAO, JUN WANG, WEI WU, Ningbo University, GUO-MENG ZHAO, California State University, Los Angeles — We report magnetic hysteresis loops in a wide temperature range (4-700 K) for silica-coated barium ferrite $BaFe_{12}O_{19}$ nanoparticles. The saturation magnetization M_s and the first magnetic anisotropy constant K are determined simultaneously from the magnetic hysteresis loop using the law of approach to saturation. It is remarkable that K is linearly proportional to M_s and varies precisely with temperature as $K(T) = K(0)[1-(T/T_C)^{1.58}]$ in the whole temperature range below the Curie temperature T_C (740 K). The unusual temperature dependence of the anisotropy constant and its linear relation with the saturation magnetization in $BaFe_{12}O_{19}$ are not predicted from the existing theoretical models.

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