

## Extraordinary magnetic behavior in $\text{TbFeO}_3$

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### Abstract

The crystallographic and magnetic properties of  $\text{TbFeO}_3$  powder were characterized by X-ray diffraction, Mössbauer spectroscopy, and magnetic moment measurement techniques. Also, the change of phase transition was observed with differential thermal analysis (DTA). From the Mössbauer spectroscopy results, isomer shift values at room temperature and 4.2 K are in the range of 0.25–0.36 mm/s, which means that the valence state of Fe ions is ferric ( $\text{Fe}^{3+}$ ). The Néel and Debye temperatures are determined to be  $T_N = 692$  K and  $\Theta = 337$  K, respectively. The magnetic moment rapidly decreases with increase in temperature up to 250 K. Above 250 K, it starts increasing and shows a convex maximum. After its maximum value about 350 K, it eventually reaches to zero. The inflection points in the  $M$ – $T$  curve are in accord with the exothermic peaks from heat capacity measurement results and magnetic hyperfine field anomaly from the Mössbauer spectroscopy results. Using the Mössbauer technique we suggest that the convex curve arises from minute spin canting, in the antiferromagnetically ordered state of the slightly distorted perovskite structure.

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