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Magnetoelectricity and magnetostriction due to the rare-earth moment in $TmAl_3(BO_3)_4$ RAJIT CHAUDHURY, Department of Physics and TcSUH, University of Houston, Houston,TX 77204-5002, B. LORENZ, Y.Y. SUN, C.W. CHU, Department of Physics and TcSUH, University of Houston, Houston,TX 77204-5002, L. N. BEZMATERNYKH, V.L. TEMEROV, Institute of Physics, Siberian Division, Russian Academy of Sciences, Krasnoyarsk 660036, Russia —
We investigated the magnetic, magnetostriction and magnetoelectric properties of d-electron free rare-earth aluminum borate $TmAl_3(BO_3)_4$ between room temperature and 2 K. The magnetoelectric polarization along the 'a' and 'c' directions reaches up to 300 μ C/m^2 at 70 kOe with the field is applied along the 'a' axis. 'c' axis magnetic field does not show any significant effect, which correlates with the fact that χ_a changed very rapidly compared to χ_c. We find that the polarization is proportional to the magnetostriction. The result of this investigation prove the existence of a significant coupling between the rare-earth magnetic moment and the lattice in $RAl_3(BO_3)_4$ compounds (R=rare earth). This compound shows that the rare-earth moment is sufficient enough to generate a large magnetoelectric effect. This is comparatively a simpler system to study and understand the origin of magnetoelectric effect.

Rajit Chaudhury
Dept of Physics and TcSUH, University of Houston, Houston,TX 77204-5002

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