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Magnetodielectric Effects and Transport Study in LuFe₂O₄ Single Crystal TAE HWAN JANG, SANG YOUNG PARK, eSSC & Dept. of Physics, POSTECH, Korea, HAI JOON LEE, SUN HEE KANG, Dept. of Physics, Ulsan Univ., Korea, TAE YEONG KOO, PAL, POSTECH, Korea, SUNG BAEK KIM, I-PEM & Dept. of Physics, POSTECH, Korea, ILL WON KIM, Dept. of Physics, Ulsan Univ., Korea, YOON HEE JEONG, eSSC & Dept. of Physics, POSTECH, Korea, SANG WOOK CHEONG, R-CEM and Dept. of Physics & Astronomy, Rutgers Univ., USA — Magnetic, dielectric, and magnetodielectric properties of geometrically frustrated mixed valence LuFe₂O₄ single crystal are discussed to clarify the charge order based ferroelectricity and its coupling with magnetism. From the magnetization and dielectric constant measurement, a new anomalous temperature point $T_{N'}$ (~ 160 K) in both magnetization and dielectric constant versus temperature curve below the ferrimagnetic transition temperature T_N (~ 225 K) has been observed. The sign of magnetodielectric effect (MDE) also changes from positive $T > T_{N'}$ into negative $T < T_{N'}$. No field hysteresis in positive MDE temperature region was found. However a large hysteretic behavior in negative MDE below $T_{N'}$, with the same magnetic coercive field measured in M (H) curve was observed. This indicates a strong coupling between magnetism and ferroelectricity in the charge and spin frustrated ferrimagnetic LuFe₂O₄ system.

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