Poster-1-8

Magneto-dielectric coupling in a magnetic high entropy oxide

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We report the dielectric and magnetic properties of epitaxial thin films of a magnetic high entropy oxide (HEO) perovskite Nd(Cr0.2Mn0.2Fe0.2Co0.2Ni0.2)O3 having magnetic ordering temperature, Tmag≈190 K. At T ≫ Tmag, the dielectric response has a significantly large zero-frequency dielectric constant of ≈230-250. The reversible dc bias voltage loops exhibit three distinct peaks centred at zero and finite positive and negative voltage. The zero-bias peak is governed by the oxygen sublattice while the finite bias peaks originate from cationic dipoles. The maximal response of the latter appears to be shifted to finite bias by a static uncompensated electric field due to a vertical gradient of the oxygen content. Below Tmag, this anomalous dielectric response is strongly suppressed. We also find that the zero freq. dielectric constant follows the non-magnetic volume fraction measured from low energy muSR. These findings indicate a unique correlation between configurational entropy, dielectric response, and magnetic properties. In combination with a large dielectric strength, it enables a non-hysteretic tuning of the dielectric response with multiple parameters like temperature, electric, and magnetic field, which can find application in perovskite electronics.

[1] R.Capu, R.Thompson, C. W.Rischau, et al. "Versatile Magneto-Dielectric Response of Epitaxial Thin Films of the High Entropy Oxide Perovskite Nd(Cr0.2Mn0.2Fe0.2Co0.2Ni0.2)O3." Advanced Materials (2026): e72992. https://doi.org/10.1002/adma.72992.