

Supporting information for

**Chemical Tuning of Room-temperature Ferrimagnetism and Ferroelectricity in ϵ -Fe₂O₃-
type Multiferroic Oxide Thin Films**

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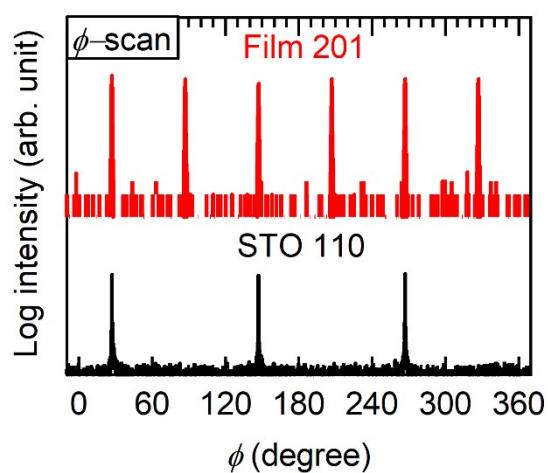


Figure S1. ϕ -scan around film {201} and STO {110} diffraction peaks for the $A = \text{Ga}$ film.

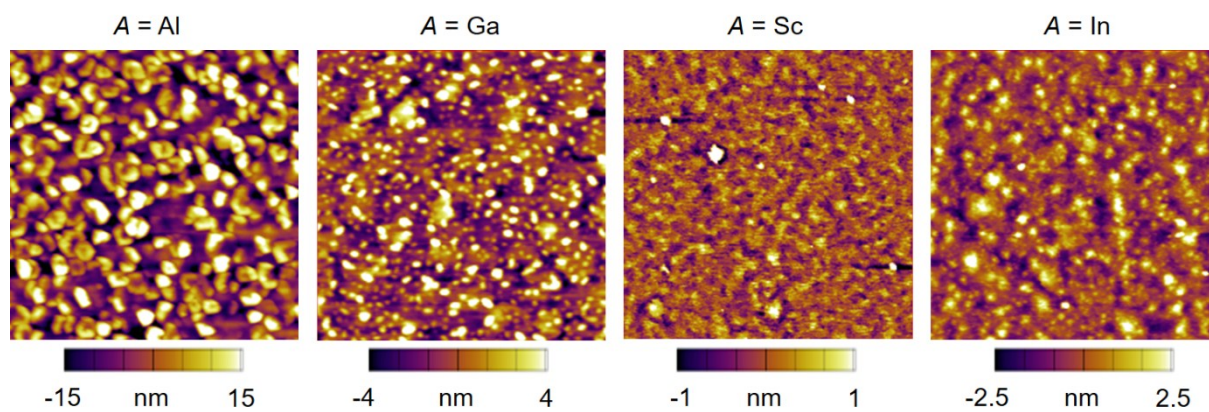


Figure S2. Surface morphology ($4 \mu\text{m} \times 4 \mu\text{m}$ size) for the $A_{0.2}\text{Ga}_{0.4}\text{Fe}_{1.4}\text{O}_3$ films ($A = \text{Al}, \text{Ga}, \text{Sc}$ and In).

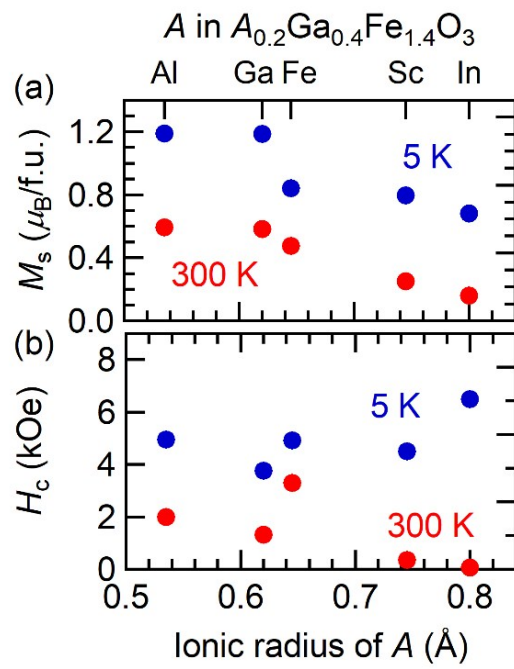


Figure S3. (a) Saturated magnetization (M_s) and (b) coercive field at 5 and 300 K for the $A_{0.2}Ga_{0.4}Fe_{1.4}O_3$ films ($A = Al, Ga, Fe, Sc$ and In) as a function of ionic radius of A .

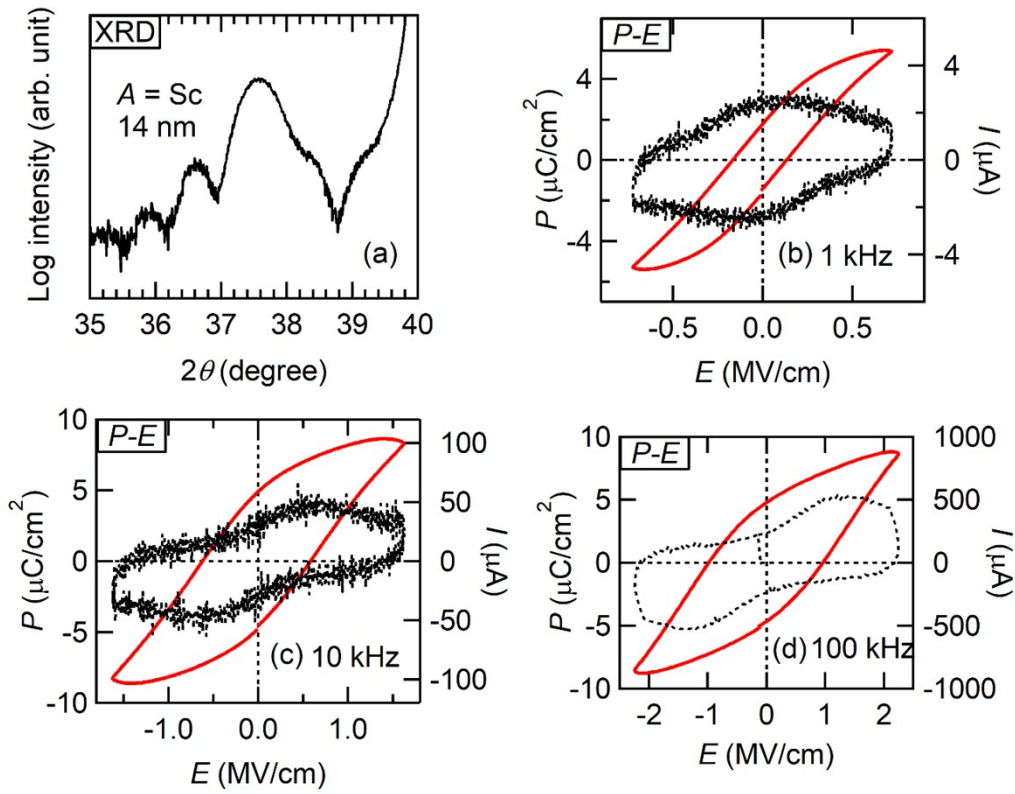


Figure S4. (a) XRD 2θ - θ pattern for the $A = \text{Sc}$ film. From the fringe peaks, we decided that thickness of the film is 14 nm. P - E and I - E curves for the $A = \text{Sc}$ film with thickness of 14 nm at room temperature at (b) 1, (c) 10, and (d) 100 kHz.

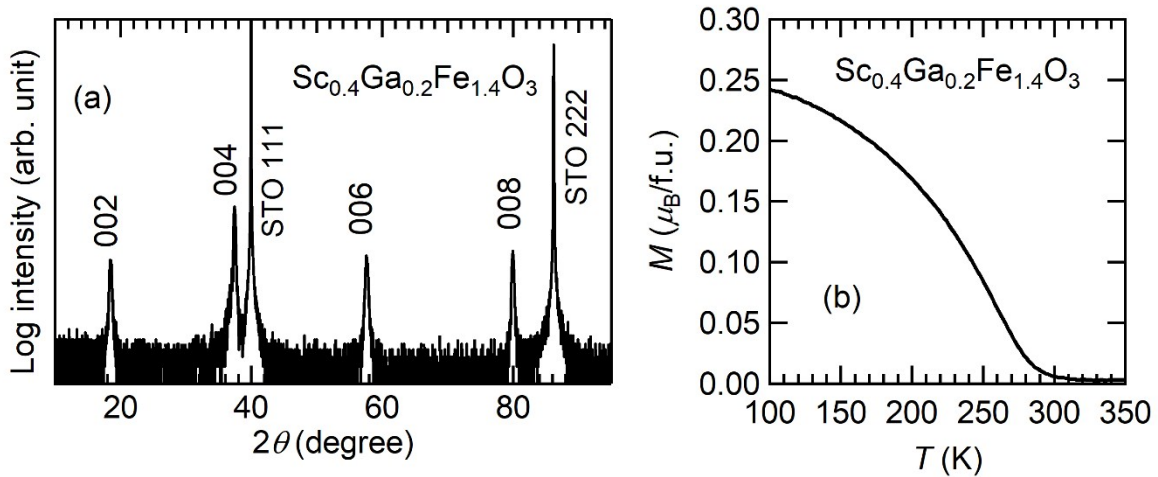


Figure S5. (a) XRD 2θ - θ pattern and (b) M - T curve for the $\text{Sc}_{0.4}\text{Ga}_{0.2}\text{Fe}_{1.4}\text{O}_3$ film. The T_C value is below 300 K.