

Piezostrain Behavior and Magnetoelectric Coupling in Co/PMN-PT Structures

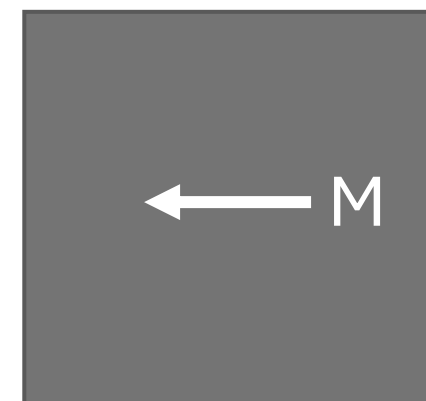
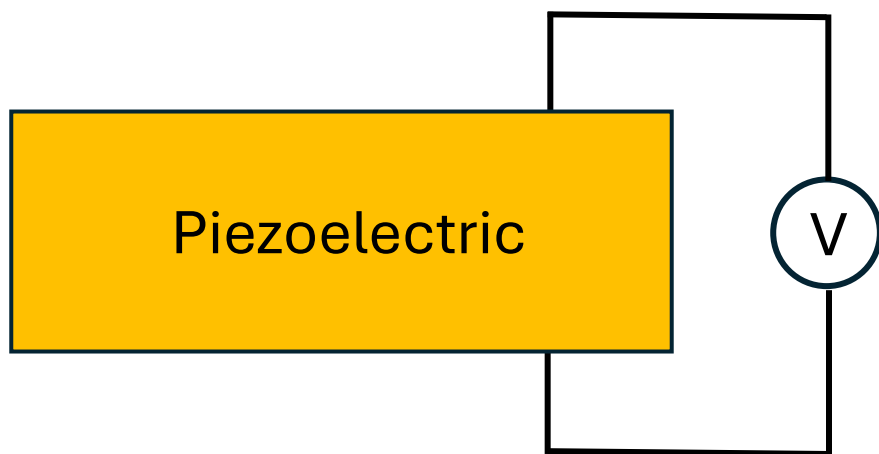
Eric Welp

The Pennsylvania State University

Mentor: Shane Lindemann

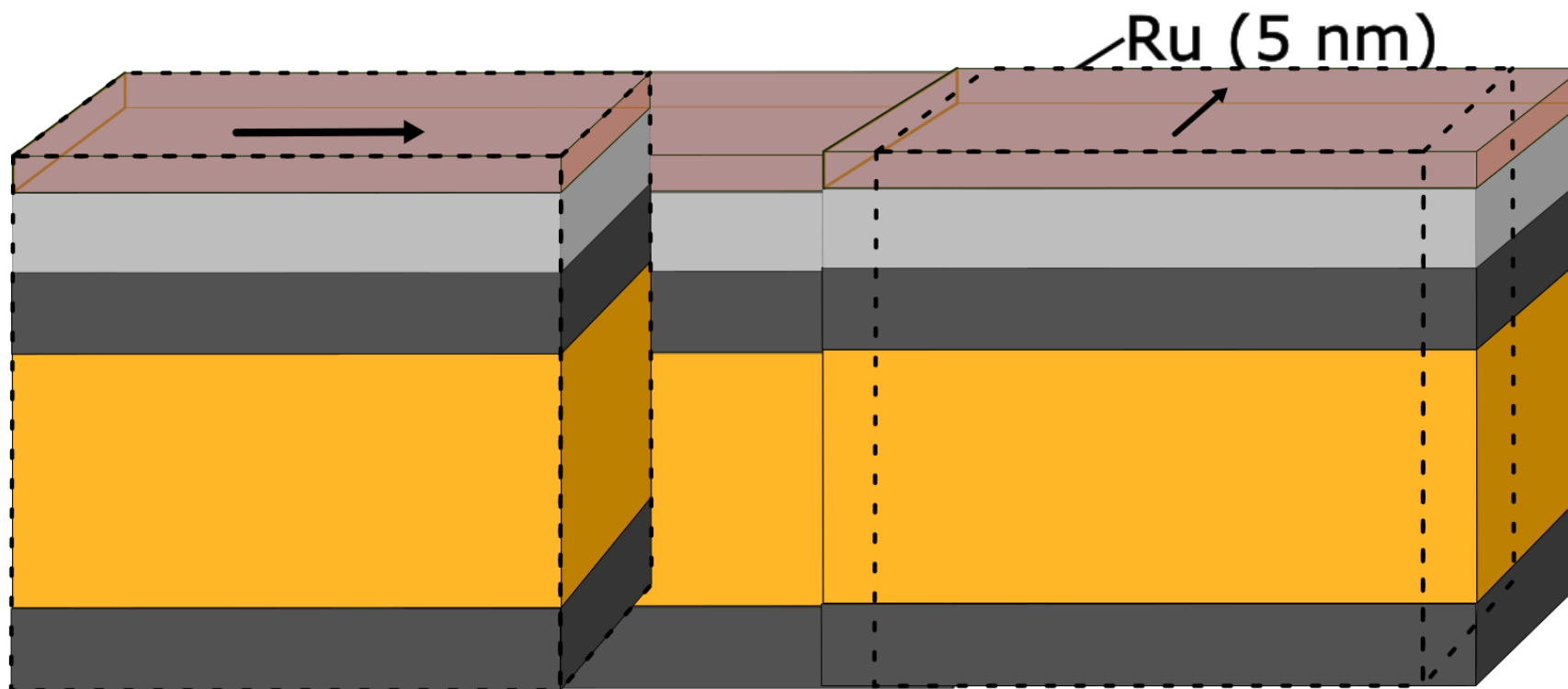
NIST Center for Neutron Research

Piezoelectrics and Magnetostriction

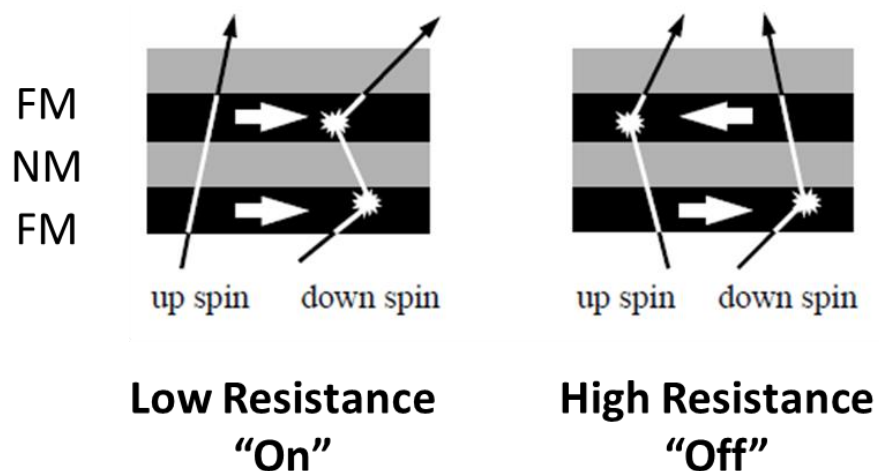


Magnetostrictive
Ferromagnet
(Cobalt)

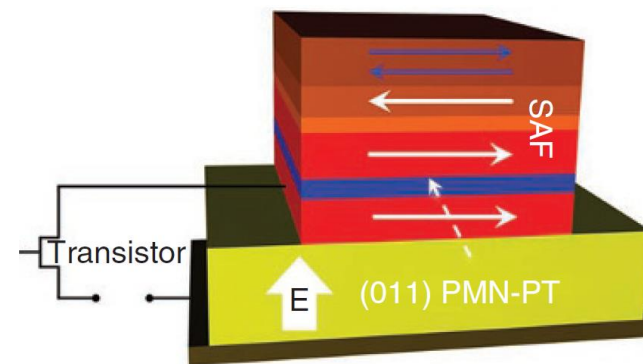
Magnetoelectric (ME) Coupling



Magnetoelectric (ME) Coupling

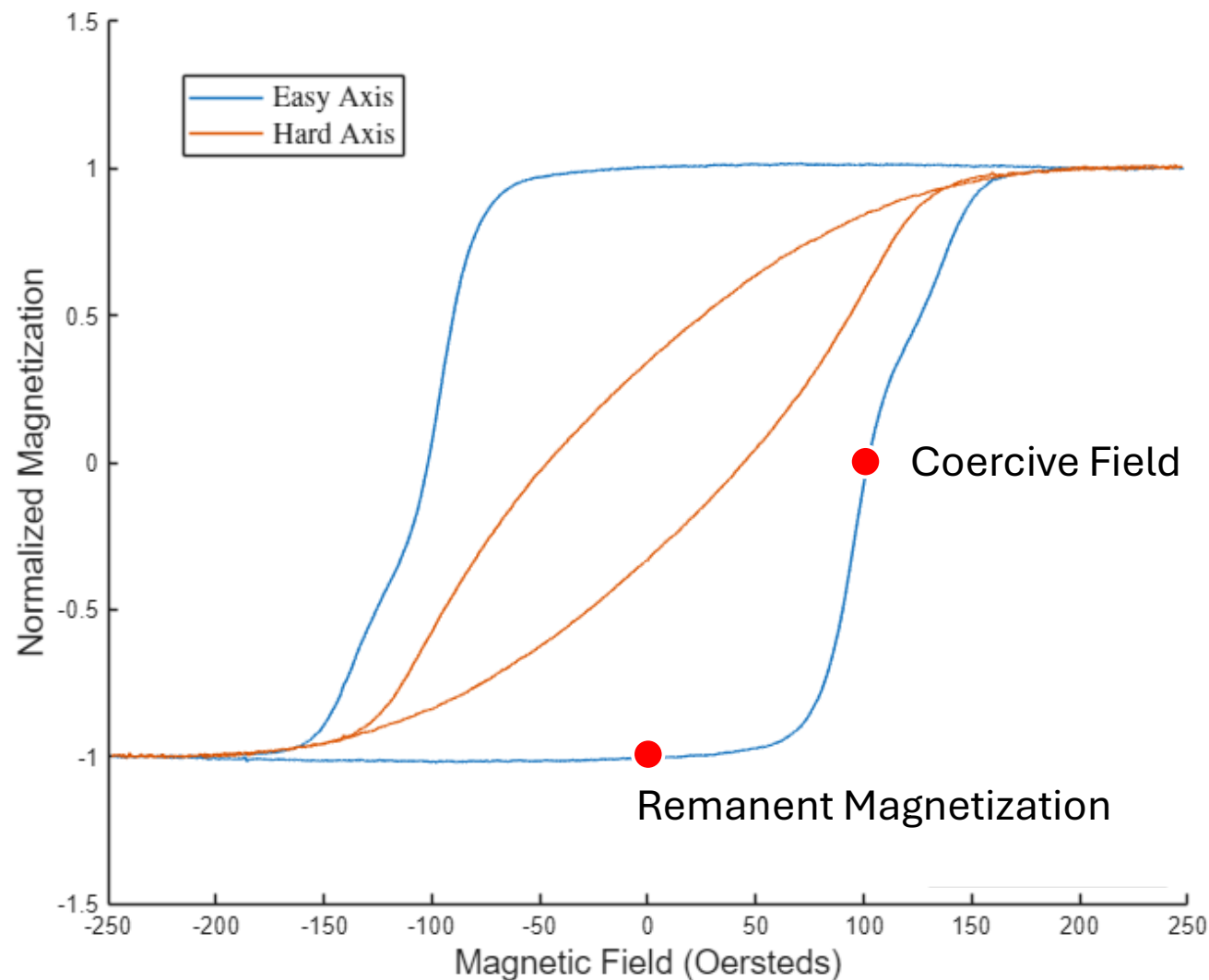
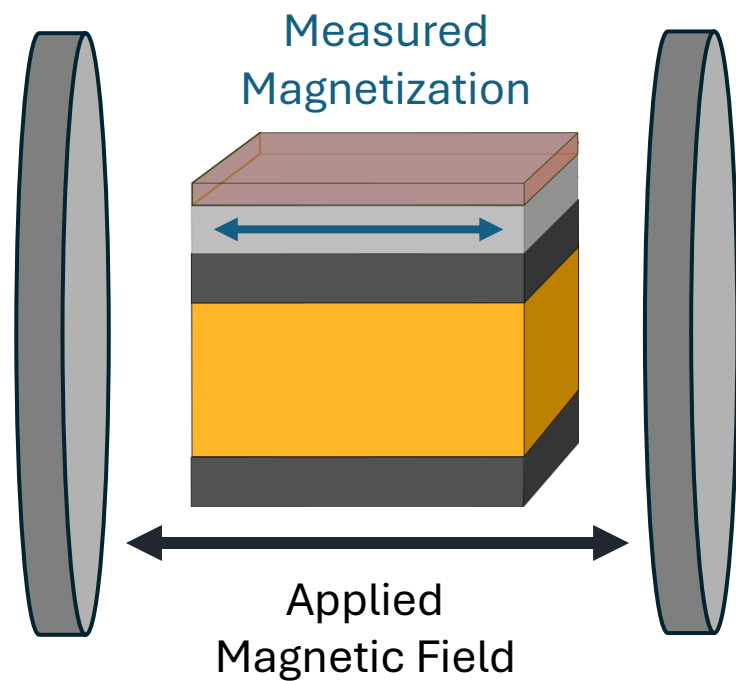


"Perspectives of Giant Magnetoresistance" (2001).
Evgeny Tsymbal Publications. Paper 50.

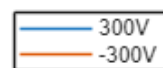
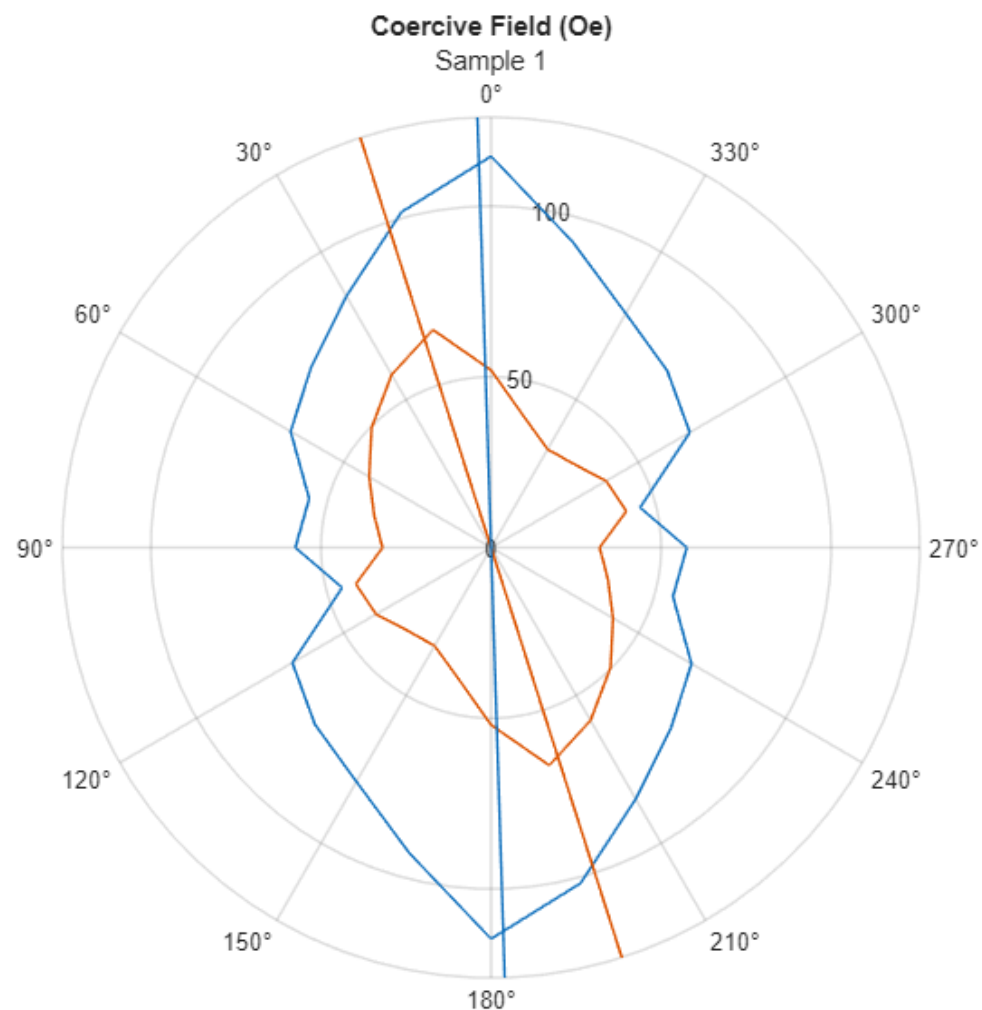


Nat. Commun. **2**, 553 (2011)

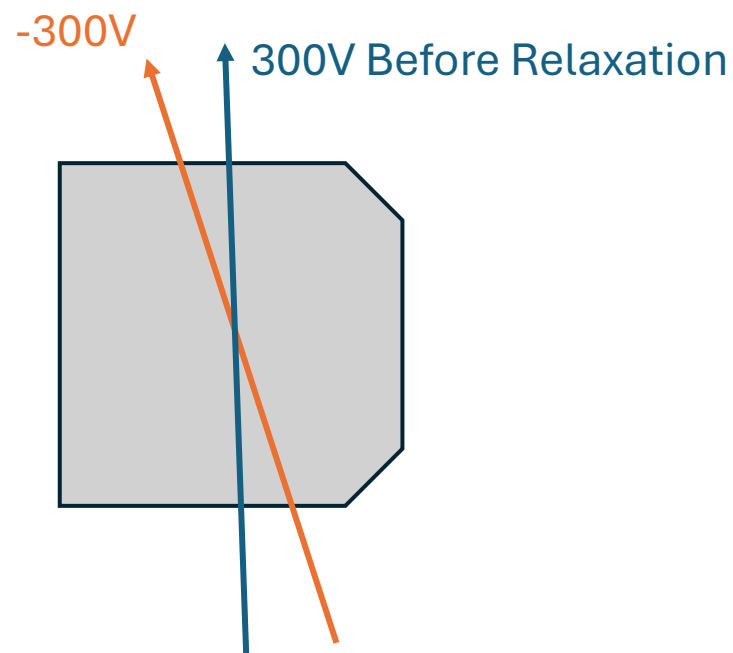
Magnetic Hysteresis



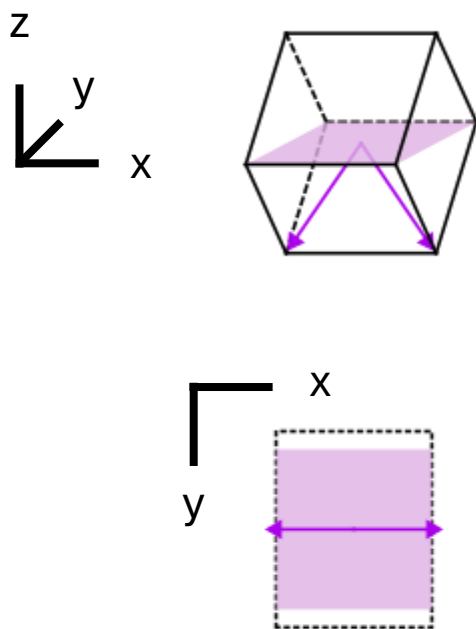
Magnetic Hysteresis



x (001)
y (0-11)

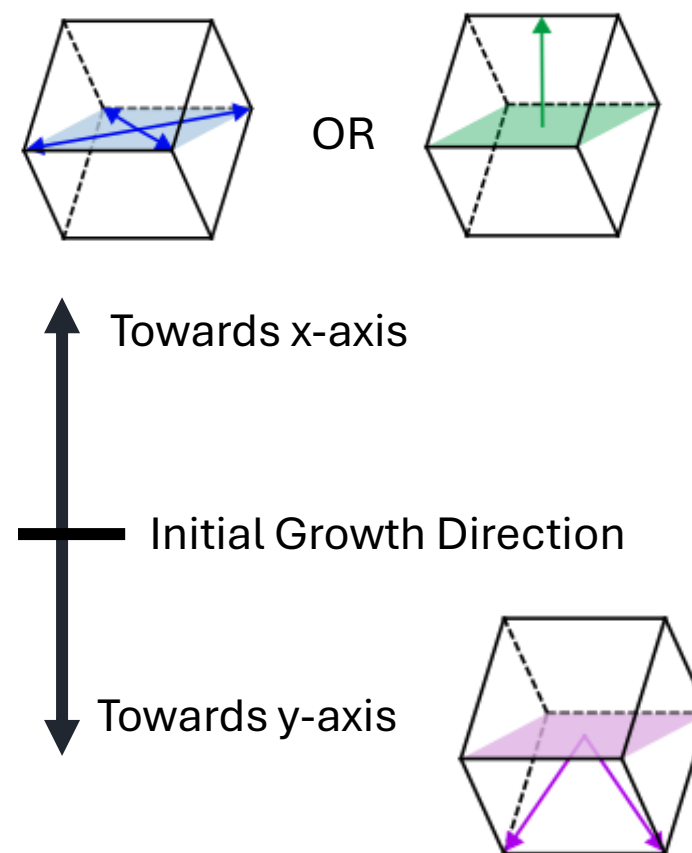
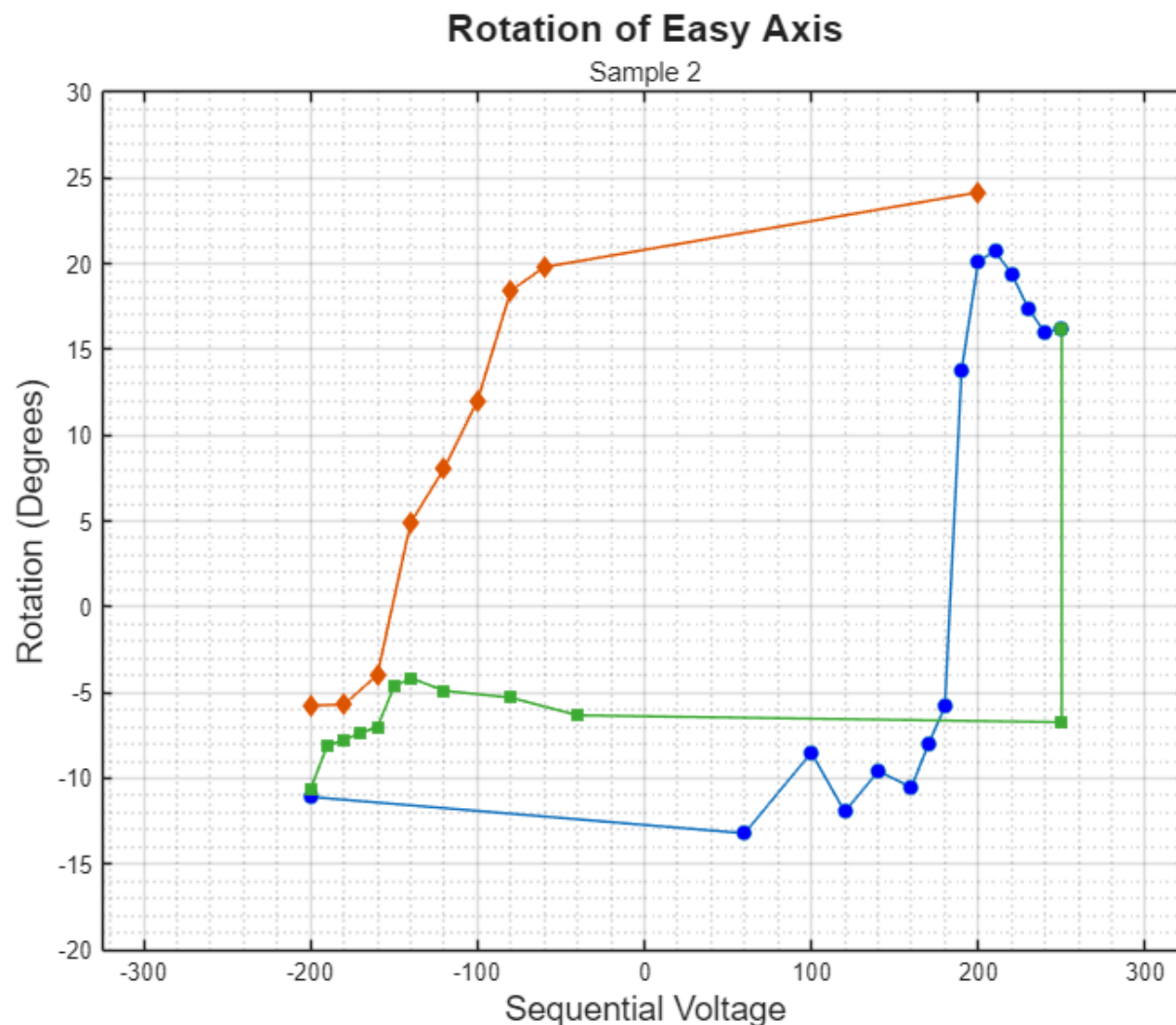


PMN-PT and Piezostrain Behavior

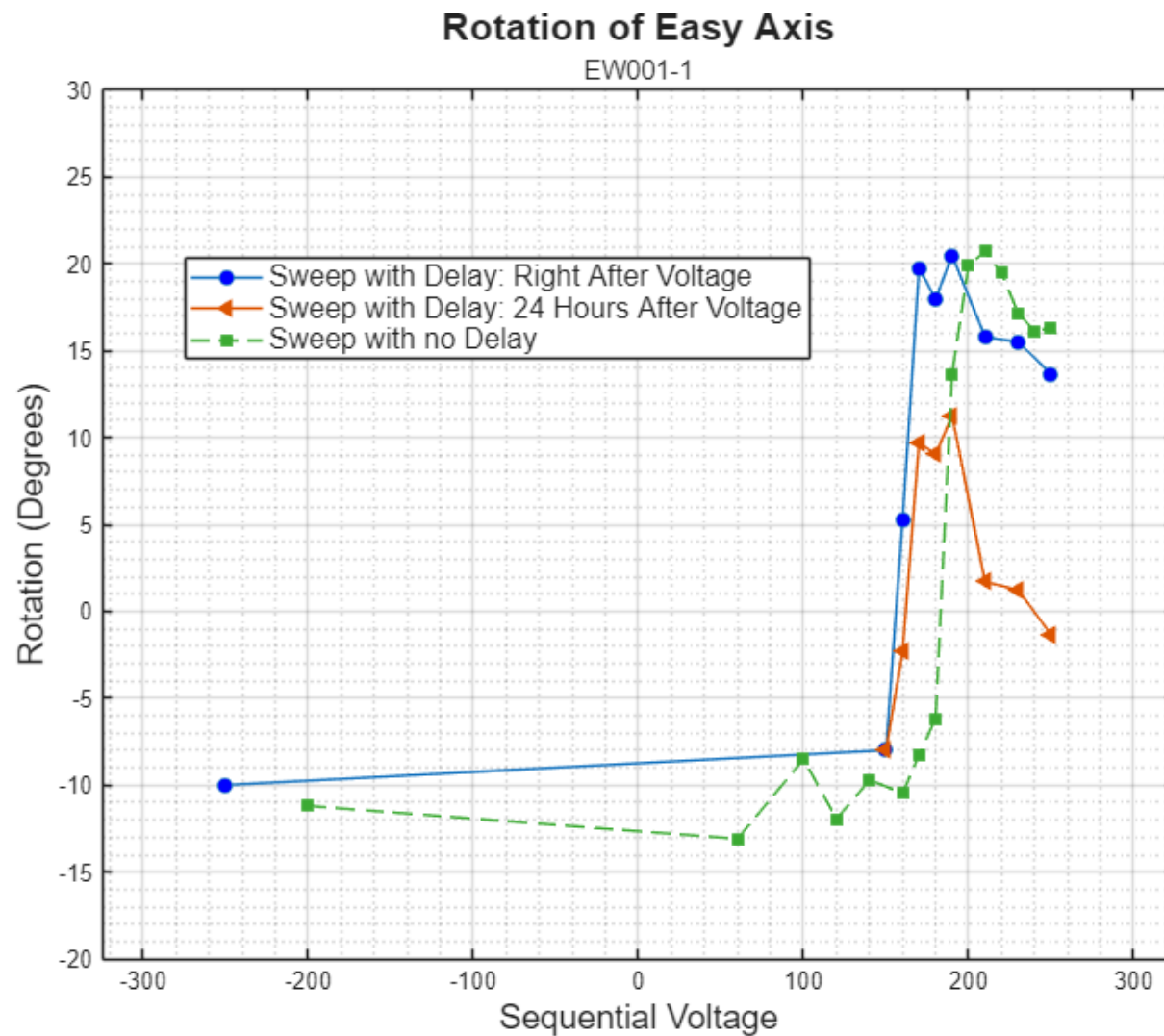


Electric field along the z-axis generates anisotropic strain in the x-y plane

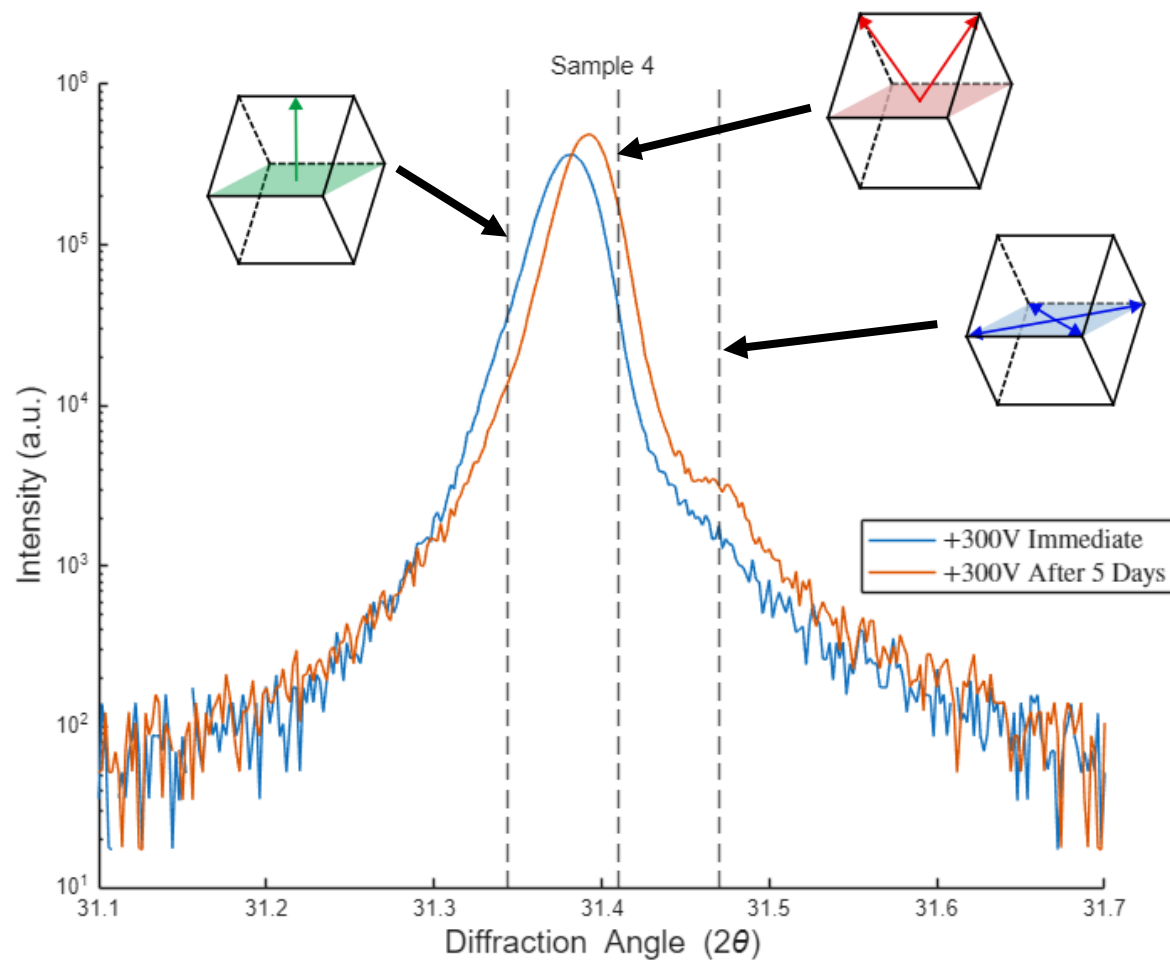
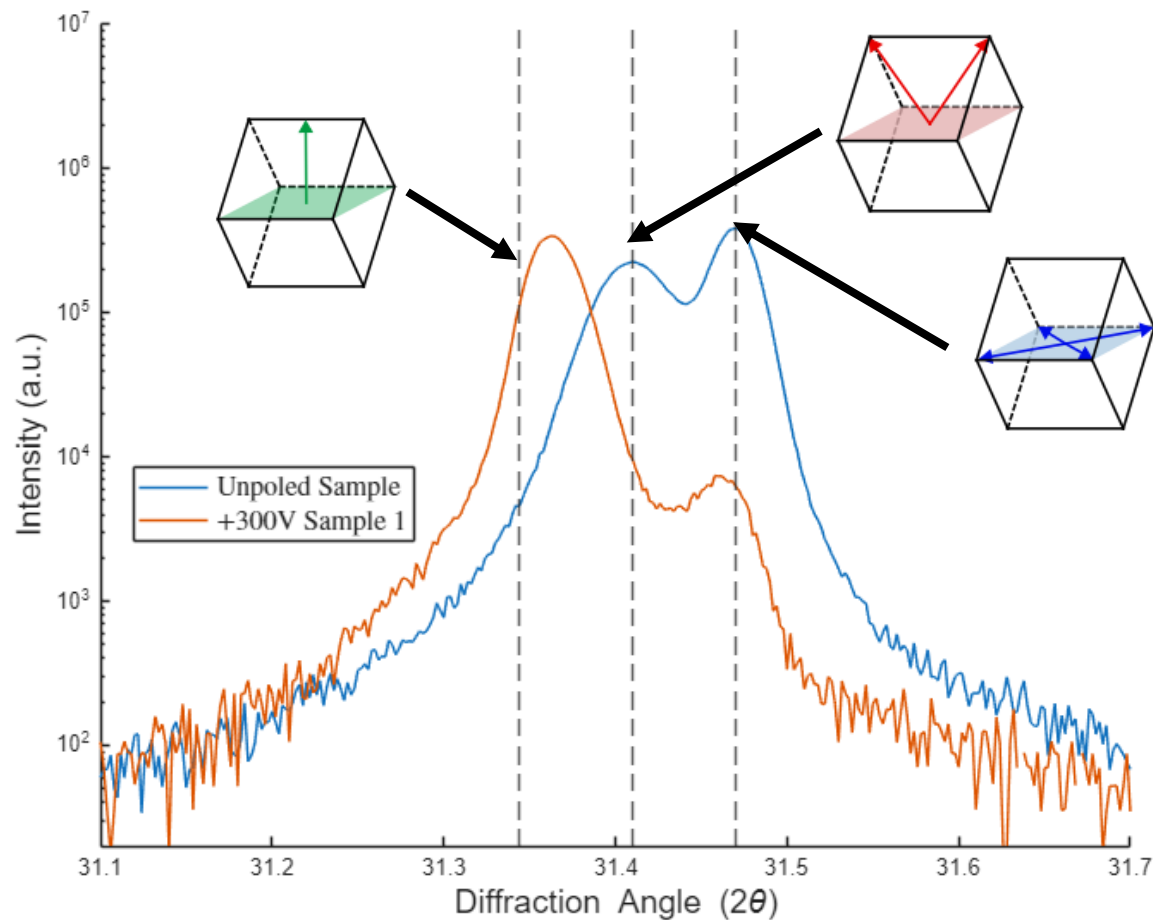
Asymmetric Magnetic Rotation

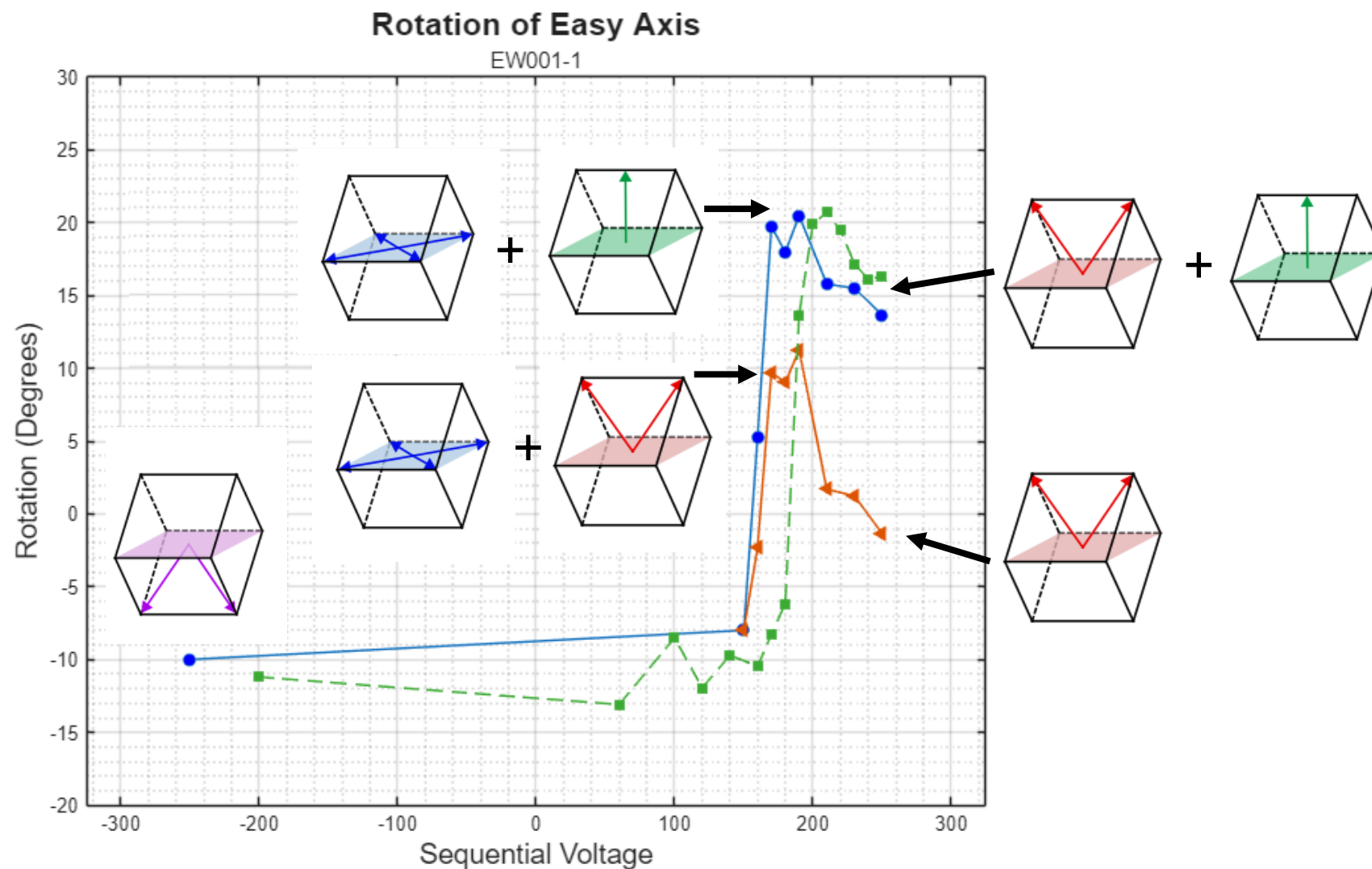


Relaxed Rotation Behavior

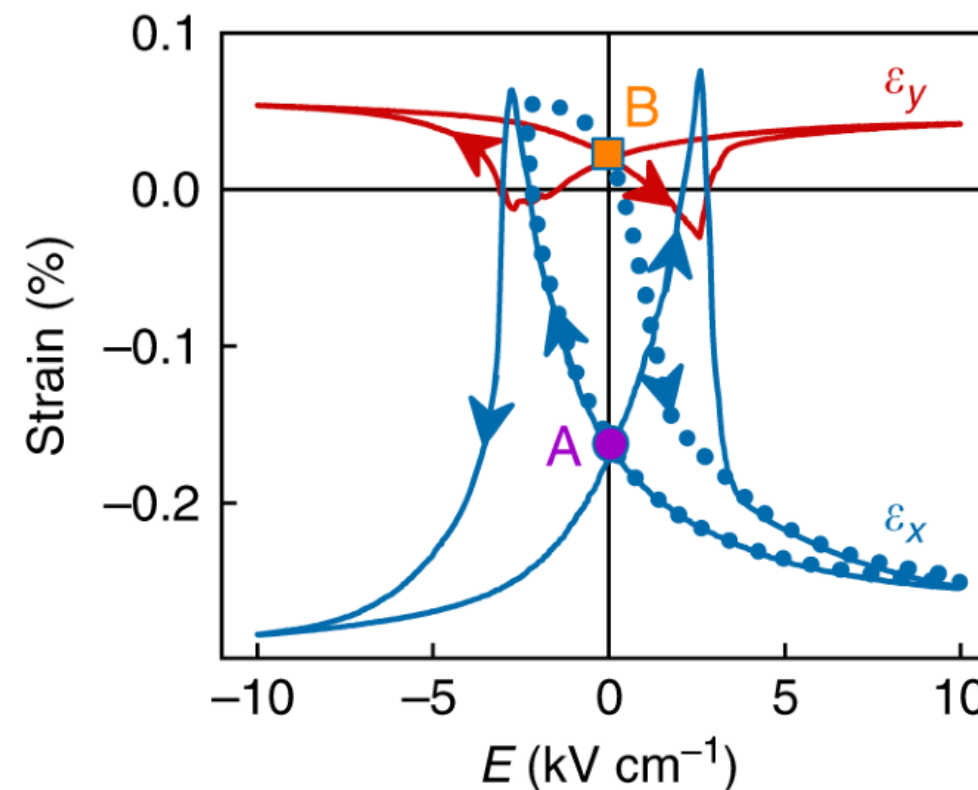
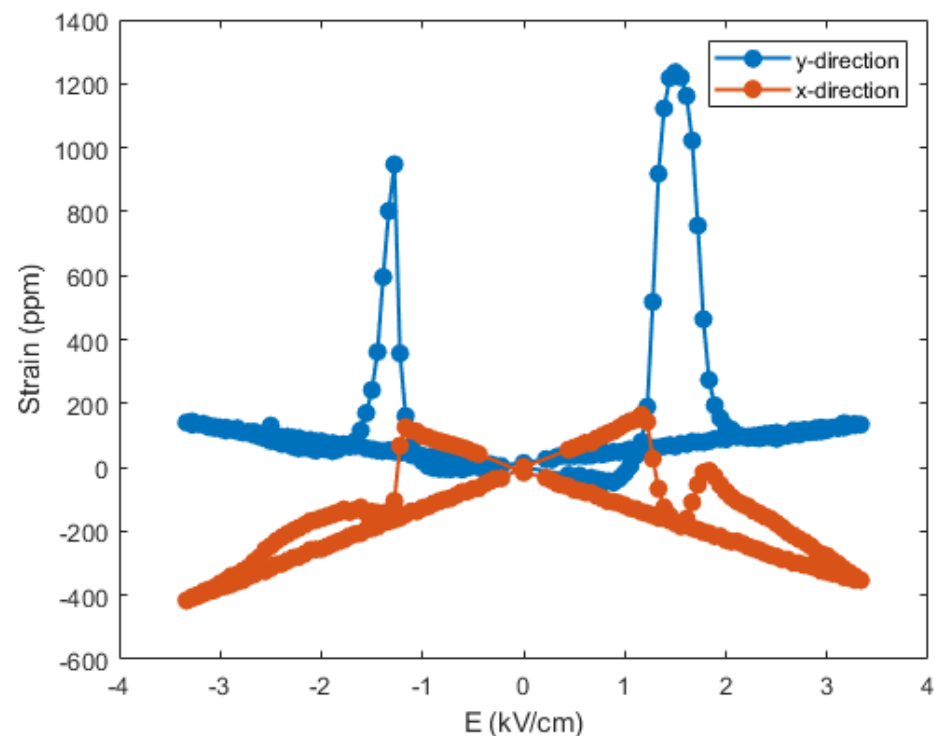


Structural Characterization





Strain hysteresis variations must be studied further by better understanding the polarization physics



Pesquera, D. et al. *Nat Commun* **11** (2020).

Acknowledgements



Mentor: Shane Lindemann

Julie Borchers

Materials Measurement Laboratory

Cindi Dennis

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Shane Lindemann et al., Low-voltage magnetoelectric coupling in membrane heterostructures. *Sci. Adv.* 7, eabh2294(2021). DOI:10.1126/sciadv.abh2294

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Time-Dependent Relaxation

