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Domain walls in hybrid improper ferroelectric $\text{Ca}_3\text{Ti}_2\text{O}_7$

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Coupling or competition between spin, charge, orbital, and structural order parameters can lead to novel properties and functionality in materials. For example, ferroelectrics that allow a coupling between the polarization and another order parameter can enable electric-field control of non-polar order parameters. This talk will focus on a recently discovered type of ferroelectricity (hybrid improper ferroelectricity) in the Ruddlesden-Popper compound $\text{Ca}_3\text{Ti}_2\text{O}_7$, where the polarization is induced via a trilinear coupling to two octahedral rotation distortions of different symmetry. This octahedral rotation-polarization coupling also leads to a complex structure of coupled domain walls. Using a combination of group theoretic analysis and density functional theory calculations, I will present scenarios for domain wall structures in $\text{Ca}_3\text{Ti}_2\text{O}_7$ and related materials.