Epitaxy of layered perovskite-based ferroelectrics:
from enhanced polarization to magnetoelectric phase design

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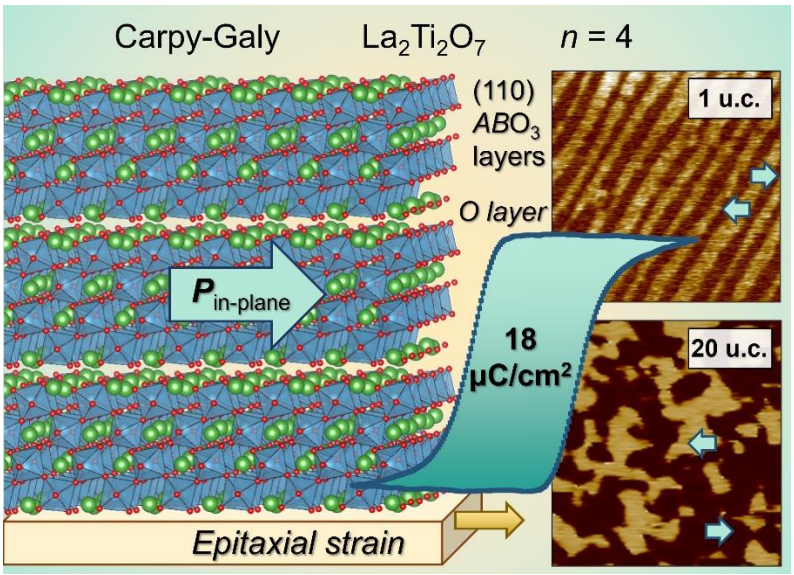
Layered perovskite-based oxides offer a versatile material platform, where inherent structural anisotropy gives rise to a wide range of functional properties. Among them, the Carpy-Galy $A_nB_nO_{3n+2}$ phases [1], characterized by 110-oriented perovskite layers interleaved with additional oxygen planes, offer in-plane ferroelectric polarization with high Curie temperatures. However, achieving phase-pure films can be challenging due to difficulties in controlling the correct layered stacking.

In this talk, I will present our recent advances on the epitaxial PLD growth of $La_2Ti_2O_7$ and $Sr_2Nb_2O_7$, $n = 4$ representatives of the Carpy-Galy family. By leveraging high epitaxial strain, we demonstrate the selective stabilization of the desired layered phase over competing polymorphs such as perovskites and kinetically favored structures. This epitaxy-driven approach enables a robust layer-by-layer growth mode, leading to phase-pure films that exhibit ferroelectricity down to the single-unit-cell limit, with polarization values up to four times higher than in bulk crystals [2]. Looking ahead, I will discuss how epitaxial stabilization of these phases [3] opens new avenues for exploring coexistence between ferroelectricity and metallicity and accessing unexplored members of the Carpy-Galy family with potential for magnetoelectric coupling.



1. Lichtenberg, F. *et al. Prog. Solid State Chem.* **36**, 253–387 (2008).
2. Gradauskaite, E. *et al. Adv. Mater.* **37,** 2416963 (2025).
3. Shao, Z. *et al. J. Mater. Chem.* **22**, 24894 (2012).