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Freeing wafer-scale stacking of single crystals from the shackles of epitaxial constraints

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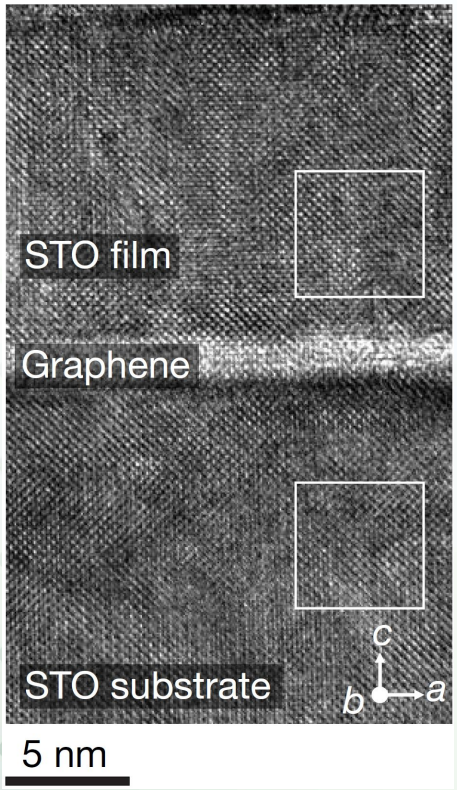
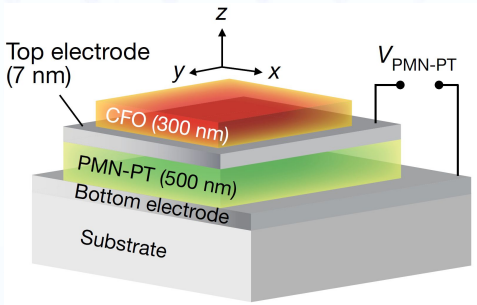
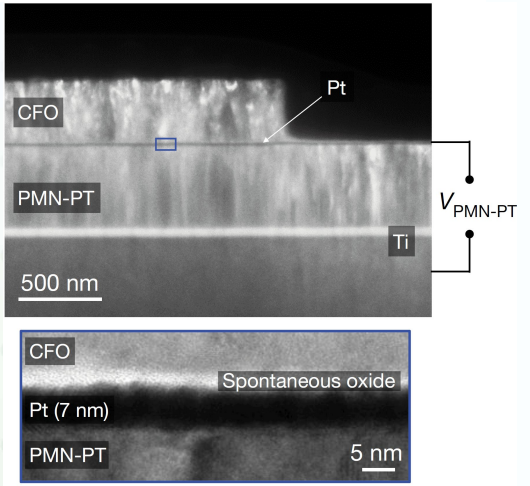
Complex oxides offer a wide range of phenomenal electrical and magnetic properties when prepared as high-quality single crystals, but integrating oxides into stacks to realize new device concepts is severely limited by constrains on structure and chemistry. Through the use of "remote epitaxy"—where graphene separates a growing oxide thin film from its substrate—superb crystallinity is achieved together with the ability to peel off oxide layers and create stacks of multiple high-quality layers assembled in a user-defined sequence. **The approach heralds a new platform for the limitless stacking of any material into any heterostructure.** Previously impossible combinations have been demonstrated that involve the stacking of structurally and chemically incompatible piezoelectrics and magnetostrictive oxides to make new composite multiferroics; oxides have been stacked with 2D materials to tune the properties of the 2D materials.

"Remote epitaxy" frees oxide integration from reactivity and structural constraints







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