Wisconsin MRSEC
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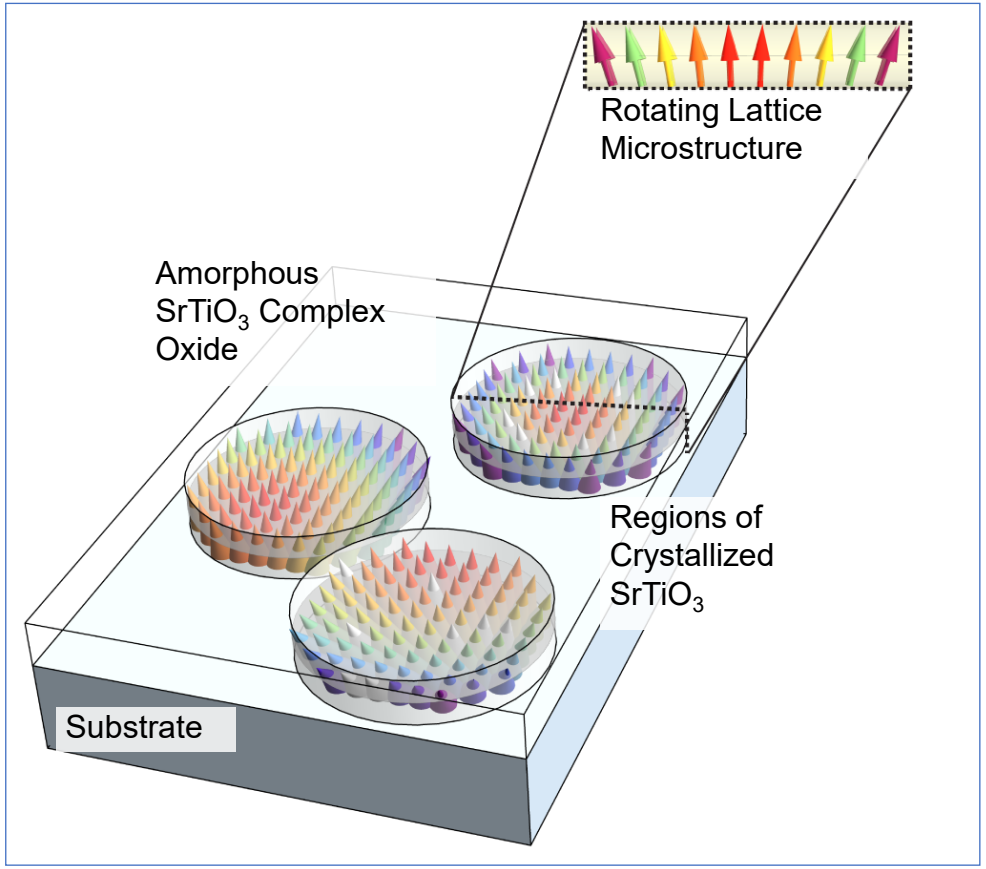
Stress-Driven Rotating Lattice in Lateral Solid-Phase Complex Oxide Crystallization

Susan Babcock and Paul Evans, University of Wisconsin-Madison

Complex oxide materials have useful electronic, magnetic, and optical properties arising from their versatile composition and crystallographic structure. Wisconsin MRSEC researchers have investigated new methods for the crystallization of complex oxides. They have found that the crystallization of amorphous complex oxide layers from isolated seed crystals presents the opportunity to remove geometric constraints posed by previous thin film epitaxial growth methods on single-crystal substrates.

When applied to a thin sheet of amorphous materials, this solid-phase-crystallization method yields crystals with a systematic microscopic variation in the orientation of the crystal lattice. This “rotating lattice” structure develops due to mechanical stress at the amorphous / crystalline interface and has not previously been observed in complex oxides. The novel microstructure provides insight into ways to control crystallization in future studies and has the potential to lead to useful properties linked to the crystallographic structure.



X-ray nanobeam diffraction measurements created maps of the crystal orientation within crystallized regions of $SrTiO_3$, leading to the discovery of the rotating lattice structure.