

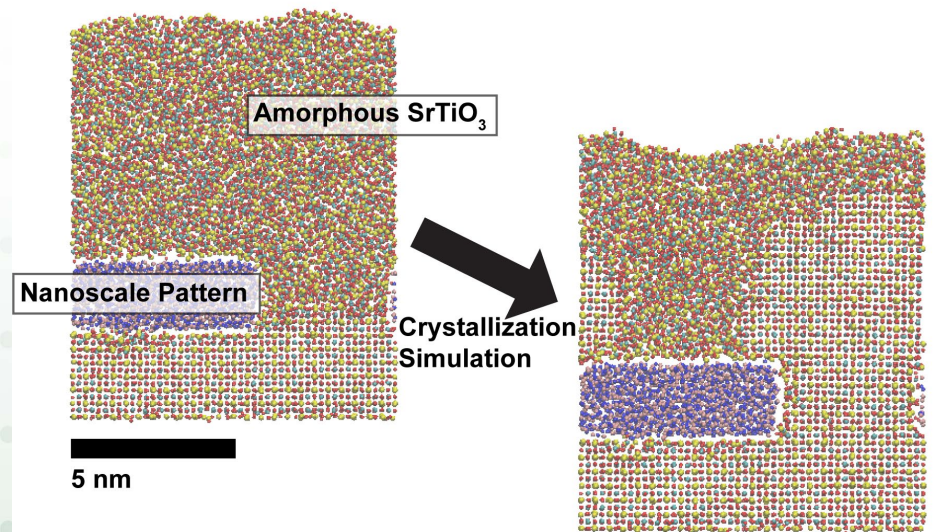
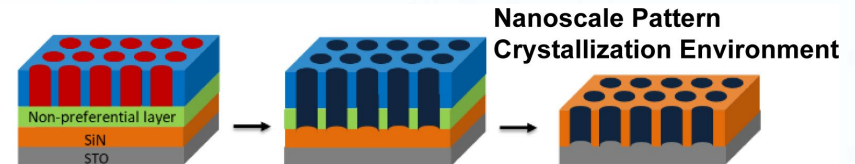
Nanoscale Oxide Solid Phase Epitaxy

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The crystallization of complex oxides can be templated by a crystalline seed. Nanoscale crystallization environments lead to the possibility that this process can be employed to create precise arrays of nanoscale materials for electronic, magnetic, and optical applications.

The Wisconsin MRSEC has adapted a technology to make patterns called block copolymer lithography to create patterns in an oxide for the first time. This achievement required introducing an intermediate layer of another material, SiN, modified to stick to both polymer components non-preferentially. The result is an array of 20 nm diameter holes covering up to 1 cm² of material.

Molecular simulations show that lateral overgrowth proceeds only after vertical growth substantially past the top of the pattern, suggesting important delays in the initiation of overgrowth via solid phase epitaxy. Simulations also show that the presence of the pattern induces complex faceting during growth, which not present in the absence of a pattern.



Nanoscale patterning yields crystallization environments for oxide solid phase epitaxy. Molecular simulations at the same length scale reveal the transition from vertical to lateral epitaxy.