Nanoscale Depth-Resolved Point Defects at $SrTiO_3$ Growth Surfaces

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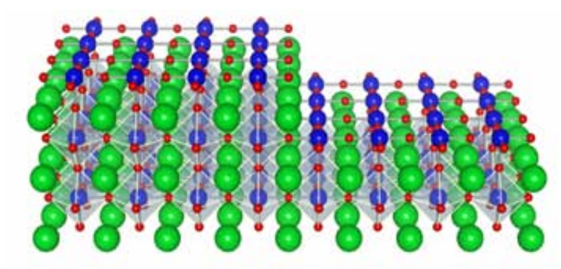
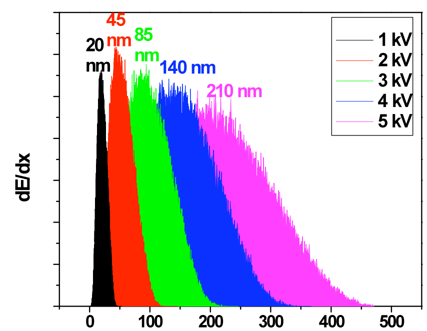
Chemically-etched $SrTiO_3$ is widely used as a clean, atomically-smooth template for epitaxical growth of most complex oxides. Since native point defects in these materials are electrically-active and mobile, there is a need to lower their density.

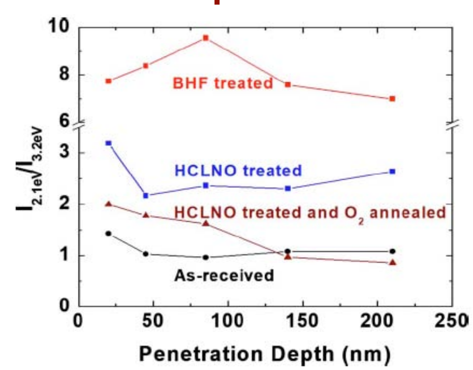
Atomically-flat, TiO_2-terminated $SrTiO_3$ surface



Depth-resolved cathodoluminescence



Defect depth profile



CEM researchers used depth-resolved cathodoluminescence spectroscopy to measure native defect densities at and below $SrTiO_3$ surfaces etched with commonly-used buffered HF versus a new HCl-HNO3 etch. While both produce well- terminated surfaces, the BHF etch creates a high-density “reservoir” of oxygen vacancies extending far into the bulk that can diffuse and introduce conductive interface channels. HCL-HNO_3 suppresses this reservoir.

Applied Physics Letters, 94 (2009) 092904

THE OHIO STATE UNIVERSITY Center for Emergent Materials

An NSF Materials Research Science and Engineering Center (MRSEC)
Supported under NSF Award Number DMR-0820414