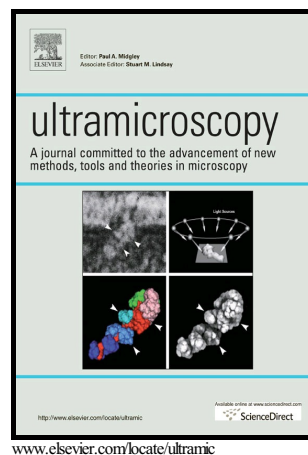


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Structure and Chemistry of Epitaxial Ceria Thin Films on Yttria-Stabilized Zirconia Substrates, Studied by High Resolution Electron Microscopy

Robert Sinclair ^a, Sang Chul Lee ^a, Yezhou Shi ^{a,b,c} and William C. Chueh ^{a,b,c}

^a Department of Materials Science and Engineering, Stanford University, Stanford, CA 94305, USA

^b Stanford Synchrotron Radiation Lightsource, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA

^c Stanford Institute for Materials and Energy Sciences, SLAC National Accelerator Laboratory, Menlo Park, CA 94025, USA

Corresponding author: bobsinc@stanford.edu, sclee99@stanford.edu

Abstract

We have applied aberration-corrected transmission electron microscopy (TEM) imaging and electron energy loss spectroscopy (EELS) to study the structure and chemistry of epitaxial ceria thin films, grown by pulsed laser deposition onto (001) yttria-stabilized zirconia (YSZ) substrates. There are few observable defects apart from the expected mismatch interfacial dislocations and so the films would be expected to have good potential for applications. Under high electron beam dose rate (above about $6,000 \text{ e}^-/\text{\AA}^2\text{s}$) domains of an ordered structure appear and these are interpreted as being created by oxygen vacancy ordering. The ordered structure does not appear at lower dose rates (ca. $2,600 \text{ e}^-/\text{\AA}^2\text{s}$) and can be removed by imaging under 1 mbar oxygen gas in an environmental TEM. EELS confirms that there is both oxygen deficiency

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