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**Cathodoluminescent Study of ThO<sub>2</sub>** MICHAEL LEE, ROBERT HENGEHOLD, TONY KELLY, Air Force Institute of Technology, DAVID TURNER, Oak Ridge Institute of Science and Education, MATT MANN, Air Force Research Laboratories — Single crystal thorium dioxide (ThO<sub>2</sub>) samples were hydrothermally grown and studied using depth-resolved cathodoluminescence (CL) to characterize the surface and bulk electronic states. X-ray diffraction (XRD) measurements confirmed that these crystals were ThO<sub>2</sub> in the fluorite structure. Understanding the chemical and structural quality of ThO<sub>2</sub> will aid in the fabrication of better neutron detectors as well as in commercial power production with thorium breeder reactors. Monte Carlo simulations were used to predict the expected energy-dependent electron interaction depths in the ThO<sub>2</sub> crystals. CL was conducted using 1.5 - 12 keV electrons at vacuums of  $5 \times 10^{-7}$  to  $1.2 \times 10^{-9}$  Torr, and sample temperatures of 24 K – 297 K. The CL measurements indicated that the as-grown sample exhibited definite surface effects. Time-of-flight secondary ion mass spectrometry (TOF-SIMS) conducted on the samples appeared to partially clean the surface as indicated by CL spectra taken following TOF-SIMS.

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