Abstract Submitted
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Ultrathin film growth of iron oxides on YSZ(001) and (111) GARY KELLOGG, IVAN ERMANOSKI, Sandia National Laboratories — We use low energy electron microscopy (LEEM) and low energy electron diffraction (LEED) to study in real time the growth of iron oxides on the (001) and (111) surfaces of yttriastabilized zirconia (YSZ). Investigations of the FeO_x-YSZ system are motivated by its use as a working oxide for thermochemical fuel production via splitting of H_2O and CO_2. LEED patterns obtained from YSZ(001) during Fe deposition in $\sim 10^{-6}$ Torr O_2 at 600 $^\circ$C and above indicate first-layer growth of FeO(111) and second-layer growth of Fe_2O_3(0001). LEEM imaging shows highly anisotropic first-layer growth into four non-equivalent domains (two rotations and two stacking orientations). Distinct LEEM-IV (intensity-voltage) spectra are obtained for the two stoichiometries providing unique fingerprints of the observed oxide phases. On YSZ(111), growth >800 $^\circ$C in O_2 is similar to (001) in that FeO is observed in the first layer and Fe_3O_4 in the second. Sandia is a multiprogram laboratory operated by Sandia Corporation, a subsidiary of Lockheed Martin, for the U.S. DOE's NNSA under contract DEAC0494AL85000. Funding was provided through Sandia's LDRD Office.

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