

Imaging Ultrathin Metal Oxides Films

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We have prepared ultrathin CeO_2 and TiO_2 films supported on various metal substrates. $\text{CeO}_2(111)$ films were grown on $\text{Pt}(111)$ and $\text{Re}(0001)$ substrates primarily to circumvent the experimental difficulties inherent to insulators but also because it is thought that $\text{CeO}_2(111)$ single crystals are contaminated with fluorine that may be mistaken for surface oxygen vacancies. The growth of ceria is tracked with low energy electron microscopy (LEEM) and X-ray photoemission electron microscopy (XPEEM) with atomic level information provided by STM. In particular, we use STM to probe individual point defects and their interactions with Au atoms and water molecules. In the case of TiO_2 , rutile (110) as well as a 2D nanosheet phase were formed on $\text{W}(100)$. The rutile phase contained a number of crystallographic shear planes which form as a way of accommodating the $\text{W}(100)$ steps and the 2D nanosheet has a lepidocrocite-like structure.