Surface Characterization of Lanthanum Aluminate (LaAlO$_3$)

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ABSTRACT

Perovskite materials such as lanthanum aluminate (LaAlO$_3$, LAO) can be used in heterogeneous catalysis as support oxides and active catalysts. Surface orientation and structure have been shown to influence catalytic activity and ordered growth. Because of the presence of high-energy "dangling bonds," a material's surface may form atomic or electronic "reconstructions." The bulk properties of LaAlO$_3$ are well understood and some surface reconstructions have been reported, while some orientations remain unexamined. This work presents initial characterizations of a model system, the LAO (111) surface, using methods including transmission electron microscopy (TEM) and x-ray photoelectron spectroscopy (XPS). The (111) samples are shown to preferentially facet, forming a (110) face. Observations of the edge are consistent with (nx1) reconstructions of the LAO (110) surface. Additionally, evidence of ordered surface structures on LAO (111) is presented. This work can be used as a basis for solving the exact structure of LAO (111) reconstructions.