Growing oxide thin films in a low-energy electron microscope

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Stellingen

Behorende bij het proefschrift
"Growing oxide thin films in a Low-Energy Electron Microscope"

1. Electron microscopy provides the only direct way to investigate oxide growth on the nanometer scale, given the combined requirements of high temperatures, real-time imaging and non-contact measurements.
   Chapter 5 of this thesis

2. The advantage of low-energy electron microscopy over reflection high-energy electron diffraction in monitoring thin-film growth lies in the possibility to capture both real-space information and reciprocal-space data, specifically wave-vector dependent electron reflectivity.
   Chapter 3 of this thesis

3. Electron reflectivity measurements allow conclusions about the stoichiometry of the surface of homoepitaxially grown $SrTiO_3$.
   Chapter 5 of this thesis

4. The unoccupied band structure of the surface of the $LaAlO_3$ layer grown on a $SrTiO_3$ substrate is a good predictor of the conductivity of the $LaAlO_3/SrTiO_3$ interface.
   Chapter 6 of this thesis

5. Francis *et al.* investigated the surface structure of LaAlO3 by measuring X-ray surface truncation rods, combined with simulations of possible surface structures. Since they only considered a singly terminated surface, their conclusions may not be correct.
   *R. J. Francis et al., Phys. Rev B **64**, 235425 (2001) and chapter 4 of this thesis.*

6. The predicted low work function of $SrVO_3$ makes this the prime candidate material as an emitter in low-energy transmission electron microscopy.
   R. Jacobs, J. Booske, and D. Morgan, arXiv 1607.02121

7. In experiments on delta-doped oxide interfaces consisting of $LaAlO_3/EuTiO_3/SrTiO_3$, the quoted amount of 10% La substitution in $EuTiO_3$ is enough to change this material from an antiferromagnetic insulator to a ferromagnetic metal. The interface may actually play no role in the observed conductivity.
   *D. Stornaiuolo et al., Nat. Mat. **15**, 278 (2015)*

8. The surface sensitivity of the hard X-ray technique used by Weiland *et al.* is too low to justify strong conclusions about the stoichiometry of the $LaAlO_3$ surface of their $LaAlO_3/SrTiO_3$ heterostructures.
   *C. Weiland et al., Phys. Rev. B **91**, 165103 (2015).*

9. Financing of research by short-term grants only is inefficient and wasteful, since the ensuing lack of continuity means loss of knowledge and suboptimal use of investments.

Alexander J.H. van der Torren,
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