Conductance and gating effects at sputtered oxide interfaces

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Propositions

accompanying the thesis

Conductance and Gating Effects at Sputtered Oxide Interfaces

1. The fact that, in $LaAlO_3/SrTiO_3$ heterostructures, the interfacial conductivity is only observed for Al-rich $LaAlO_3$ layers points to oxygen vacancies being the doping mechanism.
   Chapter 3 of this thesis.

2. Electron trapping appears to be a universal phenomenon in $SrTiO_3$-based two-dimensional electron systems when applying a gate voltage at the back of the substrate.
   Chapter 4 of this thesis.

3. Applying an external electric field can tune the Rashba spin-orbit coupling at the $LaAlO_3/SrTiO_3$ interface, but the effect is due to Fermi level variations, and therefore indirect.
   Chapter 5 of this thesis.

4. The Kondo effect at the $LaAlO_3/SrTiO_3$ interface is caused by the interactions between itinerant and localized electrons rather than between itinerant electrons and conventional magnetic impurities, such as iron.
   Chapter 6 of this thesis.

5. Warusawithana *et al.* conclude that a polar discontinuity is the mechanism for conductivity at the $LaAlO_3/SrTiO_3$ interface, but that does not explain why stoichiometric samples are insulating.
   Warusawithana et al., Nat. Commun. ***4****, 2351 (2013).*

6. Contrary to the assertion of Biscaras *et al.*, we find no filling threshold for electron trapping in $LaAlO_3/SrTiO_3$ heterostructures.
   Biscaras et al., Sci. Rep. ***4****, 6788 (2014).*

7. The quantum well depth of about 250 meV, measured on the surface of cleaved single crystals of $SrTiO_3$, suggests that cleaving, even at low temperatures, introduces a large amount of oxygen vacancies.
   King et al., Nat. Commun. ***5****, 3414 (2014).*

8. Complex oxide heterostructures allow novel functionalities on one hand, but on the other hand the complexity hampers implementation in real devices.
   Huang et al., Adv. Mater. ***30****, 1802439 (2018).*

9. "Science has no borders" will probably never happen.

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Leiden, 03-07-2019