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# Propositions

accompanying the thesis

## Conductance and Gating Effects at Sputtered Oxide Interfaces

1. The fact that, in  $\text{LaAlO}_3/\text{SrTiO}_3$  heterostructures, the interfacial conductivity is only observed for Al-rich  $\text{LaAlO}_3$  layers points to oxygen vacancies being the doping mechanism.  
*Chapter 3 of this thesis.*
2. Electron trapping appears to be a universal phenomenon in  $\text{SrTiO}_3$ -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  $\text{LaAlO}_3/\text{SrTiO}_3$  interface, but the effect is due to Fermi level variations, and therefore indirect.  
*Chapter 5 of this thesis.*
4. The Kondo effect at the  $\text{LaAlO}_3/\text{SrTiO}_3$  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  $\text{LaAlO}_3/\text{SrTiO}_3$  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  $\text{LaAlO}_3/\text{SrTiO}_3$  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  $\text{SrTiO}_3$ , 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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