Conducting Oxide Interfaces: New Opportunities for Electronics and Electrocatalysts

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Abstract:

The recent progress in the epitaxial growth of complex oxide thin films with precise control on atomic scale has provided us unforeseen opportunity to design heterostructures with on-demand functionalities. Herein, I will discuss our recent discoveries of metallic interfaces or two-dimensional electron gases (2DEGs) at the interface between two insulating complex oxides, such as gamma-Al_2O_3 (GAO) epitaxially grown on $SrTiO_3$ (STO) [1], magnetically diluted oxide interfaces[2], as well as the large enhancement of the interfacial electron mobility [3, 4] and quantum Hall effect [5] at modulation-doped oxide interfaces. Perspectives on oxide electronics [6] as well as oxide heterointerfaces for superior electrocatalysts will be also discussed.

Reference:

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2. Y. L. Gan *et al.* Diluted oxide interfaces with tunable ground states. ***Adv. Mater.* 31,** 1805970 (2019)
3. Chen, Y. Z. *et al.* Extreme mobility enhancement of two-dimensional electron gases at oxide interfaces via charge transfer induced modulation doping. ***Nature Mater.* 14**, 801 (2015)
4. Y. Z. Chen *et al. Tuning the two-dimensional electron liquid at oxide interfaces by buffer-layer-engineered redox reactions*. ***Nano Lett.* 17,** 7062-7066 (2017)
5. F. Trier *et al.* Quantization of Hall resistance at the metallic interface between an oxide insulator and SrTiO3. **Phys. Rev. Lett.** 117, 096804 (2016).
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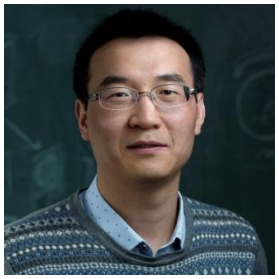
Brief Bio:



Yunzhong Chen received his Ph.D. in Condensed Matter Physics in 2009 from Institute of Physics, Chinese Academy of Sciences, China and the classic Doctor Technices Degree (Dr. Techn.) from Technical University of Denmark in 2016. From 2009-2011, He was a post-doc researcher at Risø National Laboratory for Sustainable Energy, Denmark and became a scientist in Department of Energy Conversion and Storage (DTU Energy), Technical University of Denmark in 2011. Since 2013, he has been an associate professor at DTU Energy. His research focuses on the creation and understanding of the interface phenomena in atomically engineered complex oxide heterostructures for high electronic and/or ionic conductivity, ferromagnetism, high-temperature superconductivity, thermoelectricity, and enhanced catalytic activity. He has published 81 peer reviewed journal papers, including 6 Nature journal papers.