



A high mobility two-dimensional electron gas at the CaZrO₃/SrTiO₃ heterointerface

Chen, Yunzhong; Trier, Felix; Christensen, Dennis Valbjørn; Linderoth, Søren; Pryds, Nini

Publication date:
2016

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Chen, Y., Trier, F., Christensen, D. V., Linderoth, S., & Pryds, N. (2016). *A high mobility two-dimensional electron gas at the CaZrO₃/SrTiO₃ heterointerface*. Abstract from TO-BE Spring Meeting 2016, Warwick, United Kingdom.

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

A high mobility two-dimensional electron gas at the $\text{CaZrO}_3/\text{SrTiO}_3$ heterointerface

Y.Z. Chen^{*}, F. Trier, D. V. Christensen, S. Linderoth, and Nini Pryds
 Department of Energy Conversion and Storage, Technical University of Denmark, Roskilde,
 Denmark
^{*} yuc@dtu.dk

The discovery of two-dimensional electron gases (2DEGs) in SrTiO_3 -based heterostructures provides new opportunities for nanoelectronics^{1,2}. Herein, we create a new type of oxide 2DEG by the epitaxial-strain-induced polarization at an otherwise nonpolar perovskite-type interface of $\text{CaZrO}_3/\text{SrTiO}_3$.^{3,4} Remarkably, this heterointerface is atomically sharp, and exhibits a high electron mobility exceeding $60,000 \text{ cm}^2\text{V}^{-1}\text{s}^{-1}$ at low temperatures. The 2DEG carrier density exhibits a critical dependence on the film thickness, in good agreement with the polarization induced 2DEG scheme.

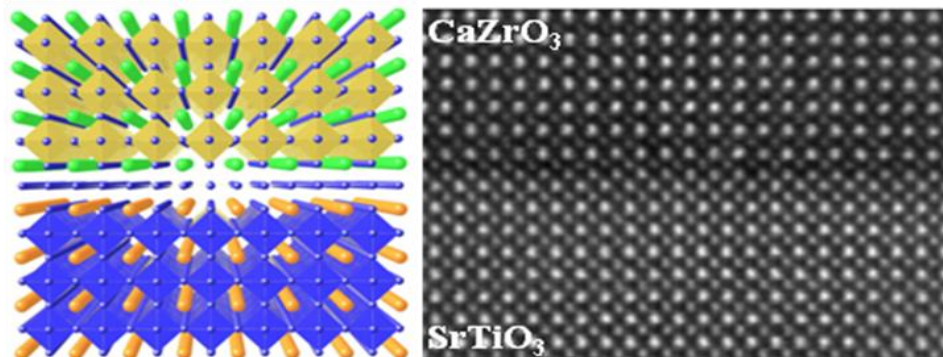


Figure 1. Atomically-flat epitaxially grown perovskite-type interface of $\text{CaZrO}_3/\text{SrTiO}_3$ determined by STEM-EELS.

Reference:

1. A. Ohtomo, H. Y. Hwang, A high-mobility electron gas at the $\text{LaAlO}_3/\text{SrTiO}_3$ heterointerface. *Nature* **427**, 423-426 (2004).
2. Chen Y. Z. *et al.* A high-mobility two-dimensional electron gas at the spinel/perovskite interface of $\gamma\text{-Al}_2\text{O}_3/\text{SrTiO}_3$. *Nature Commun.* **4**, 1371 (2013).
3. Chen Y. Z. *et al.* Creation of high mobility two-dimensional electron gases via strain induced polarization at an otherwise nonpolar complex oxide interface. *Nano Lett.* **15**, 1849 (2015).
4. S. Nazir, J. Cheng, K. Yang, Creating Two-Dimensional Electron Gas in Nonpolar/Nonpolar Oxide Interface via Polarization Discontinuity: First-Principles Analysis of $\text{CaZrO}_3/\text{SrTiO}_3$ Heterostructure. *ACS appl. Mater. Interfaces.* **8**, 390 (2016).