Two-dimensional electron gases in SrTiO3-based complex oxide heterostructures with electron mobilities exceeding 100,000 cm2V-1s-1

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Two-dimensional electron gases in $SrTiO_3$-based complex oxide heterostructures with electron mobilities exceeding 100,000 $cm^2V^{-1}s^{-1}$

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The high-mobility two-dimensional electron gas (2DEG) confined at the interface of two insulating complex oxides provides new opportunities to explore nanoelectronic devices. So far, such oxide 2DEG is nearly exclusively created within the frame of interface polarity, such as the case of the intensively explored $LaAlO_3/SrTiO_3$ (LAO/STO) heterointerface. Alternatively, when building heterostructures on STO, the basis material for oxide electronics, the conductance can also originate from tunable redox reactions at the interface, i. e. the oxygen-vacancies dominated conductivity in reduced STO substrates [1]. In this presentation, the mechanism of the interface conductance in STO-based oxide heterostructures will be discussed. Moreover, our recent findings of new 2DEGs in STO-based oxide heterostructures will be also present. Relying on redox reactions, an oxide 2DEG with electron mobilities exceeding 100,000 $cm^2V^{-1}s^{-1}$ at 2 K, 100 times higher than those of LAO/STO heterointerface, is obtained [2]. The conduction dimension and its spatial confinement will be also discussed.

1. Y. Z. Chen *et al.*, *Nano Lett.* **11**, 3774 (2011).
2. Y. Z. Chen *et al.*, *Nature Communications*. (2012) (accepted).

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