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

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A high mobility two-dimensional electron gas at the CaZrO\textsubscript{3}/SrTiO\textsubscript{3} heterointerface

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The discovery of two-dimensional electron gases (2DEGs) in SrTiO\textsubscript{3}-based heterostructures provides new opportunities for nanoelectronics\textsuperscript{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 CaZrO\textsubscript{3}/SrTiO\textsubscript{3}.\textsuperscript{3,4} Remarkably, this heterointerface is atomically sharp, and exhibits a high electron mobility exceeding 60,000 cm\textsuperscript{2} V\textsuperscript{-1} s\textsuperscript{-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 CaZrO\textsubscript{3}/SrTiO\textsubscript{3} determined by STEM-EELS.

Reference:

2. Chen Y. Z. \textit{et al.} A high-mobility two-dimensional electron gas at the spinel/perovskite interface of γ-Al\textsubscript{2}O\textsubscript{3}/SrTiO\textsubscript{3}. Nature Commun. 4, 1371 (2013).