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One-dimensional Electron Gases at Oxide Interfaces[1] YANWEI CAO, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA, ZHICHENG ZHONG, Institute for Theoretical and Astrophysics, University of Wurzburg, Am Hubland 9704, Wurzburg, Germany, P. SHAFER, Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA, XIAORAN LIU, M. KAREEV, S. MIDDEY, D. MEYERS, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA, E. ARENHOLZ, Advanced Light Source, Lawrence Berkeley National Laboratory, Berkeley, California 94720, USA, JAK CHAKHALIAN, Department of Physics, University of Arkansas, Fayetteville, AR 72701, USA — Emergence of two-dimensional electron gases (2DEG) at the oxide interfaces of two dissimilar insulators is a remarkable manifestation of interface engineering. With continuously reduced dimensionality, it arises an interesting question: could one-dimensional electron gases (1DEG) be designed at oxide interfaces? So far there is no report on this. Here, we report on the formation of 1DEG at the carefully engineered titanate heterostructures. Combined resonant soft X-ray linear dichroism with electrical transport and the first-principles calculations have confirmed the formation of 1DEG driven by the interfacial symmetry breaking. Our findings provide a route to engineer new electronic and magnetic states.

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