When two become one - DTU Orbit (01/01/2019)

**When two become one: an insight into 2D conductive oxide interfaces**

Recent progress has led to conductance confinement at the interface of complex oxide heterostructures, thereby providing new opportunities to explore nano-electronic as well as nano-ionic devices. In this paper we describe how interfacial contiguity between materials can trigger redox reactions inducing metallic conductivity along the interface of SrTiO$_3$-based heterostructures and create new types of 2D Electron Gases (2DEG) at the hetero-interface with electron mobility enhancements of more than one order of magnitude higher than those of hitherto investigated perovskite-type interfaces. Furthermore, our recent results, examining strain effects at interfaces, demonstrate the potential of achieving hetero-epitaxial thin films with superior ionic or electronic properties. We also present a novel concept that uncovers a wide variety of possible technological opportunities for materials design utilizing ionic conducting multi-layered heterostructures. These findings hold the potential to pave the way for novel and/or superior all-oxide electronic and ionic devices.

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