**Two-dimensional Transport Phenomena in Complex Oxide Heterostructures**

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Extensive studies of two-dimensional electron gas (2DEG) at complex oxide interfaces have revealed a plethora of new phenomena not present in conventional semiconductors. The novel ground states of the oxide interfaces have provided promising platforms for studying quantum physics as well as developing device applications. Recently, its counterpart, two-dimensional hole gas (2DHG), has also been reported at an epitaxially-grown SrTiO3/ LaAlO3/ SrTiO3 heterostructure. The presence of the highly-mobile hole carriers at oxide heterointerface makes the oxide systems more interesting and intriguing in terms of novel electronic correlations. In this talk, I will first introduce the recent progress on the study of oxide 2DEG characteristics and their applications. Then, I will also present the highly-mobile 2DHG in similar but different oxide heterostructures. The electrical transport measurements and in-line electron holography provide direct evidences of a 2DHG that coexists with a 2DEG at complementary heterointerfaces in the same structure. The precise control of interfacial atomic structure and the removal of point defects are prerequisites to realizing 2DEG-2DHG bilayer at the oxide heterointerfaces. The comprehensive study on 2D transport at oxide interfaces are actively on progress. In particular, the coexistence of a 2DEG and a 2DHG in a single oxide heterostructure will enable us to study exciting new physics of confined electron–hole bilayers and to develop novel device applications as well.