**Complex Oxide Heterostructures for Novel Device Applications**

Hyungwoo Lee

*Department of Physics, Ajou University*

Perovskite transition-metal oxides have shown interesting physical phenomena mainly due to the strong electron correlation effect. Particularly, complex oxide heterostrucutres, consisting of two (or more) different oxides, attract great attention, because they have provided many novel states at their interfaces, such as metal-insulator transition, magnetism, multiferroicity, and superconductivity. The novel ground states of the oxide interfaces have provided promising platforms for studying interesting new physics as well as developing device applications. In this talk, I will introduce the recent progress on the study of oxide heterostructures, particularly the two-dimensional charge transport phenomena at oxide interfaces. I will first present a two-dimensional electron gas (2DEG) at the oxide interfaces. The origin, characteristic features, and reversible control of it will be introduced. Then, I will also present the two-dimensional hole gas (2DHG) at oxide interfaces, which has been discovered just recently. The atomic-scale interface engineering and the in-depth defect study enabled the realization of the highly mobile 2DHG at the oxide interfaces. Lastly, I will discuss about the potential of those oxide heterostructures for novel device applications, including tunnel junctions, non-volatile memory, and sensor platforms.