

Electronic coupling of p- and n-type interfaces between perovskite band insulators

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Electronic reconstruction between two insulating oxides can give rise to conductivity at the interface. We report a study on the coupling between p- and n-type interfaces in band insulator SrTiO₃ - LaAlO₃ thin film multilayer structures, of which the atomic stacking sequence is examined by quantitative transmission electron microscopy. Electronic coupling occurs below a critical separation distance of 6 perovskite unit cell layers, corresponding to approximately 23 Å, resulting in a decrease of the interface conductivity. This coupling between interfaces allows tuning of the carrier density, conductivity and dimensionality of the interface electron gas, which is important for all-oxide devices.