Contribution ID: **455** Type: **Oral**

Quantum scattering mechanisms in the nonpolar $CaZrO_3/SrTiO_3$ heterointerface

Tuesday 22 May 2018 11:15 (15 minutes)

The electron mobility data from the nonpolar $CaZrO_3/SrTiO_3$ heterostructure are analyzed. We proposes the electron scattering mechanism from background impurity (BI) scattering, interface roughness (IR) scattering, electron-electron (EE) scattering and polaron-longitudinal optical (LO) phonon scattering to describe the experimental data. We find that the total mobility based on Matthiessen's rule provides good quantitative agreement to the experimental results. At low temperatures, the mobility is limited by BI and IR scatterings. The increasing of electron density, the scattering limited low-temperature mobility crosses over from the BI scattering to IR scattering. At temperatures between 10 and 250 K, the EE scattering is dominant. At room temperature, the mobility is determined by both EE and polaron-LO phonon scatterings.

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Session Classification: A16: Magnetic and Semiconductor

Track Classification: Magnetic and Semiconductor Physics