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The origin of the 2DEG at oxide polar-non polar interfaces: electron reconstruction versus defect doping[1] CLAUDIA CANTONI, Oak Ridge National Laboratory, FABIO MILETTO GRANOZIO, CARMELA ARUTA, Università di Napoli Federico II & CNR-SPIN, JAUME GAZQUEZ, MARK OXLEY, ANDREW LUPINI, MARIA VARELA, STEPHEN PENNYCOOK, Oak Ridge National Laboratory, UMBERTO SCOTTI DI UCCIO, PAOLO PERNA, Università di Napoli Federico II & CNR-SPIN, DANIELE MARRÈ, Università di Genova & CNR-SPIN — In spite of intense research efforts, the microscopic mechanism underlying the formation of a 2DEG at the LaAlO3(LAO)/SrTiO3(STO) interface is still controversial. In particular, there is no consensus on whether the interface charge stems from an electronic reconstruction or from mobile electrons introduced by oxygen vacancies and/or cation doping. We present direct, atomic-column-resolved scanning transmission electron microscopy and electron energy loss measurements in LAO/STO and LaGaO3(LGO)/STO interfaces. We find that both the measured injected charge, the low concentration of point defects, and the lattice polarization are consistent with a model of electronic reconstruction in LAO/STO. On the other hand, LGO/STO interfaces grown in the same conditions show negligible polar lattice distortions and an injected charge incompatible with electronic reconstruction. Conductivity here is explained by the observed cation intermixing and the presence of oxygen vacancies.

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