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Orbital Inversion and Carrier Confinement in $SrTiO_3/LaAlO_3$ Interfaces Grown on $NdGaO_3$ Substrates MARK GOLDEN, University of Amsterdam (UvA), E. SLOOTEN, B. SHI, B. ZWARTSENBERG, UvA, Z. HUANG, T. VENKATESAN, A. ANNANDI, National University of Singapore, M. GORGOI, F. RADU, R. ABRUDAN, P. MIEDEMA, C. SCHUESSLER, HZB Berlin, J. GOEDKOOP, UvA, D. DOENNIG, J. MUNDING, R. PENTCHEVA, University of Munich, A. ARIANDO, National University of Singapore — We investigate the role of the $SrTiO_3$ thickness on the electronic properties of heterointerfaces comprised of $NdGaO_3$ (bulk) / $SrTiO_3$ (n uc) / $LaAlO_3$ (15 uc) using X-ray linear dichroism (XLD) in absorption, Hard X-ray Photoemission Spectroscopy (HAXPES) and DFT+U calculations. XLD shows an orbital inversion for *all* STO thicknesses: the lowest energy *d*-orbitals are of *xz/yz* character, unlike 'regular' STO/LAO, in which the *xy* orbitals are lowest in energy. For n<6 transport shows the carriers to be localized, HAXPES data showing electronic confinement to the NGO/STO interface. For STO thickness ≥8 uc, only weak localization is seen in transport, the STO/LAO interface becomes populated and carrier concentrations approaching half an electron per unit cell are deduced from both Hall measurements and HAXPES. Data from layer-resolved DFT+U calculations on STO/LAO and STO/NGO superlattices, and from NGO/STO/LAO are presented and compared to the experimental data, thereby providing a complete picture of the orbital polarization in these systems.

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