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Direct k-space mapping of the electronic structure in oxide-oxide interfaces M. SING, F. PFAFF, J. GABEL, L. DUDY, G. BERNER, P. SCHUETZ, University of Wuerzburg, Germany, H. FUJIWARA, Osaka University, Japan, A. YAMASAKI, Konan University, Japan, Y. SAITOH, JAEA, SPring-8, Japan, A. SEKIYAMA, S. SUGA, Osaka University, Japan, V. ROGALEV, V. STROCOV, SLS, Paul Scherrer Institute, Switzerland, Y.Z. CHEN, N. PRYDS, Technical University of Denmark, R. CLAESSEN, University of Wuerzburg, Germany — Novel quantum phases can form at oxide heterointerfaces. Famous is the 2D electron system (2DES) in $LaAlO_3/SrTiO_3$ (LAO/STO). Its origin has been related to electronic reconstruction (ER). There electrons are transferred to the interface to compensate the potential gradient due to the polar discontinuity. The novel Al_2O_3 (AO)/STO also exhibits a 2DES but with much higher mobility [1]. In contrast to LAO, AO is regarded to be non-polar [1]. Hence ER should not be at work. It is assumed that O vacancies (Ovac) at the STO side of the interface induce the 2DES. We have directly mapped the k-resolved electronic structure of the interface states by resonant soft x-ray photoemission [2]. While we find a dichotomy of mobile and trapped charge – the latter being ascribed to Ovac –, in both systems, they also show remarkable differences regarding the proportion of mobile and trapped carriers, the electron dispersions and Fermi surfaces, shedding light on the different role of Ovac.

[1] Y.Z. Chen et al, Nat. Comm. 4, 1371 (2013)
[2] G. Berner et al, PRL 110, 247601 (2013)

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