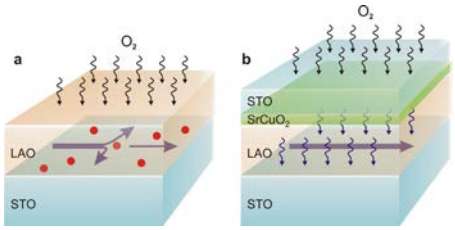
20a-C7-5

Defect engineering in oxide heterostructures by enhanced oxygen surface exchange

Mark Huijben, University of Twente, MESA+ Institute for Nanotechnology

E-mail: m.huijben@utwente.nl



The synthesis of materials with well-controlled composition and structure improves our understanding of their intrinsic electrical transport properties. Recent developments in atomically controlled growth have been shown to be crucial in enabling the study of new physical phenomena in epitaxial oxide heterostructures. Nevertheless, these phenomena can be influenced by the presence of defects that act as extrinsic sources of both doping and impurity scattering. Control over the nature and density of such defects is therefore necessary, are we to fully understand the intrinsic materials properties and exploit them in future device technologies. Here, we show that incorporation of a strontium copper oxide nano-layer strongly reduces the impurity scattering at conducting interfaces in oxide $LaAlO_3$-$SrTiO_3$(001) heterostructures, opening the door to high carrier mobility materials [1]. We propose that this remote cuprate layer facilitates enhanced suppression of oxygen defects by reducing the kinetic barrier for oxygen exchange in the hetero-interfacial film system. This design concept of controlled defect engineering can be of significant importance in applications in which enhanced oxygen surface exchange plays a crucial role.

Keywords: defect engineering, oxide heterostructure, interface, electron gas, mobility

[1] M. Huijben, et al., Advanced Functional Materials, accepted for publication