At the interface between electron- and hole-doped cuprates

We report on the fabrication of in-plane ramp-edge structures between c-axis oriented superconducting $Nd_{1.85}Ce_{0.15}CuO_4$ (NCCO) and $La_{1.85}Sr_{0.15}CuO_4$ (LSCO). The ab-plane contact allows us to explore p/n physics in the rich phase diagram of the cuprates. Interesting predictions have been made for these material combinations, such as a Josephson LED[1] and, focusing more on the underlying Mott physics of the cuprates, excitonic effects[2] and unconventional electronic interface structures[3].

The LSCO/NCCO p/n junctions show non-linear IV characteristics, indicative of the formation of a depletion layer, while both electrodes are superconducting. We explore the nature of the depletion layer by incorporating over-doped NCCO and LSCO as interlayer materials and looking at LSCO-LSCO and NCCO-NCCO contacts.

[1] Hu, et al., PRL 99, 067004 (2007)
[2] Rademaker, et al., EPL, 97 27004 (2012)
[3] Charlebois, et al, PRB 87, 035137 (2013)
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