Oxide Interface Engineering - a Route towards Superconductivity?

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Recent theoretical considerations suggest that orbital engineering of the electronic structure of spin one-half transition metal based oxides can open new perspectives for high-T_c superconductivity [1,2]. We focus on the nickelate system and report technological prerequisites to prepare nickelate-based oxide interfaces. The basis of this approach is seen in our previous work on ferromagnet-superconducting oxide superlattices where the electronic properties of the system is explained by a combination of charge transfer and modifications of the orbital occupancy at the interface [3,4]. We prepared $LaNiO_3/LaAlO_3$ heterostructures of various compositions and explored their properties with emphasis on structure and interface related defects. Defect chemistry at interfaces will be introduced as new concept for a better understanding of the interface properties and several related problems will be discussed as a path for further progress in achieving interface superconductivity in complex oxide heterostructures.

[1] in cooperation with G. Christiani, A. Boris, B. Keimer and J. Maier

[1] J. Chaloupka and G. Khaliullin, PRL 100, 016404 (2008).

[2] P. Hansmann et al. arXiv:0807.0408

[3] J. Chakhalian et al. Nature Physics 2 (2006) 244

[4] J. Chakhalian et al. Science 318 (2007) 1114