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Advanced Cu L3 edge RIXS studies of layered cuprate thin films

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High resolution soft x-ray RIXS has been quickly evolving and among its initial applications the study of layered cuprates has emerged as probably the most successful. This is due to the favorable combination of an exceptionally strong resonant enhancement at the Cu L3 edge with a particularly simple theoretical description of the RIXS process for the 3d9 configuration. Thus the energies of dd excitations were recently determined for several insulating parent compounds [1]. And the measurement of spin-wave dispersion with RIXS was first demonstrated [2,3]. Soon after Cu L RIXS has been used on high Tc superconductors (LSCO, YBCO, NdBCO) revealing the exceptional persistence of mid-range magnetic correlation also in the superconducting state [3,4].

We present here recent results obtained on epitaxial films, with spectra measured both at the SLS ADRESS and at the ESRF ID08 beam lines. In doped and undoped $NdBa_2Cu_3O_{7-\delta}$ we have studied the unexpected behavior of the elastic peak. Our results suggest the presence of dynamical stripe formation at critical doping levels. In undoped $CaCuO_2$ we have studied the dependence of the crystal field and superexchange interaction as function of the epitaxial strain and of the interface density.

[1] M Moretti Sala et al, N. J. Phys 13 043026 (2011)
[2] L.J.P. Ament et al, Phys. Rev. Lett. 103, 117003 (2009)
[3] L. Braicovich et al, Phys. Rev. Lett. 104, 077002 (2010)
[4] M. Le Tacon et al, Nat. Phys. 2041 (2011)

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