MULFOX-ALBA (Boreas)

XAS in ABO_3 oxides and interfaces

PhDs (Blai Casals, D. Pesquera, etc)

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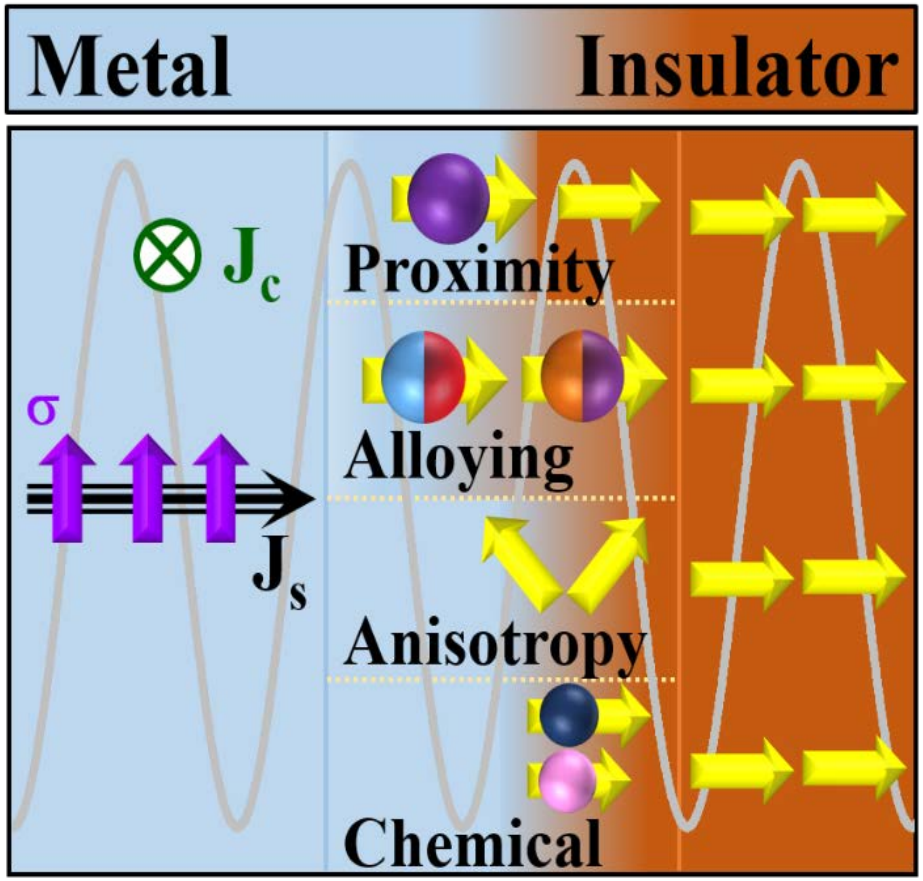
LABORATORY OF MULTIFUNCTIONAL THIN FILMS AND COMPLEX STRUCTURES

Scientific interests

- Magnetic orders and magnetic interactions
- Electron occupancy and orbital polarization
  - In-operando
- Charge-spin conversion. Spin currents
- Charge-orbital momentum conversion. Orbital currents

❑ Magnetic orders and magnetic interactions

➢ EX. 1: Magnetism of Pt at CoFe2O4/Pt interfaces



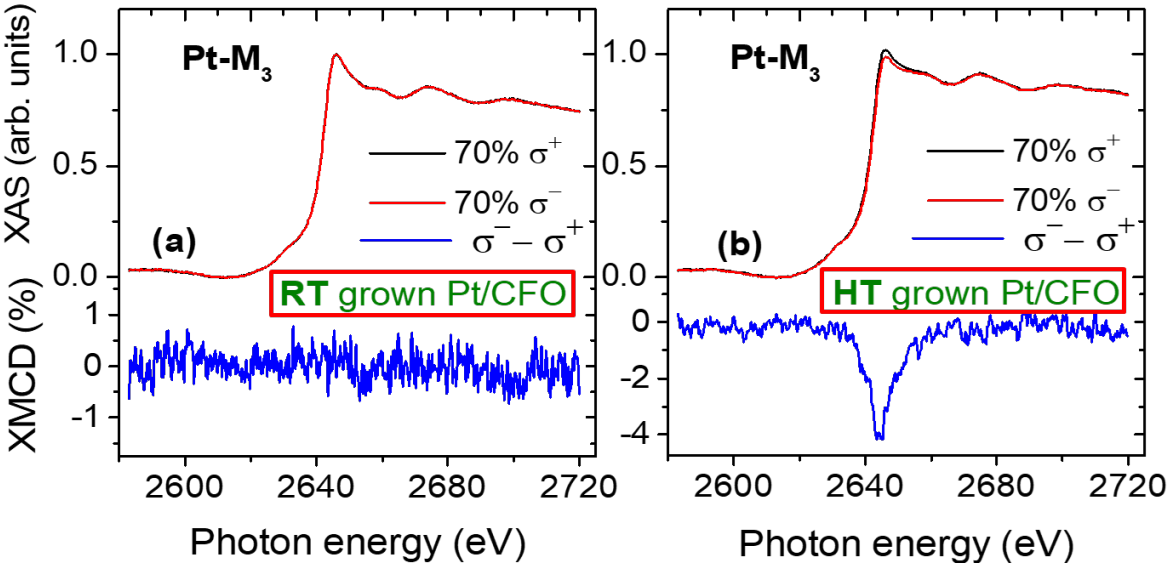
❑ Magnetic orders and magnetic interactions

➢ EX. 1: Magnetism of Pt at CoFe2O4/Pt interfaces

- Uncommon used of Pt-M_3 edge

XAS

XMCD



M. Valvidares et al. Phys. Rev B. 93, 214415 (2016)

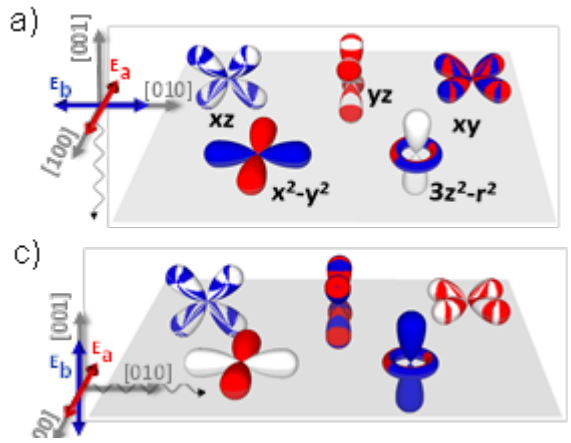
H. B. Vasili et al, Appl. Mater. Interfaces 2018, 10, 12031−12041

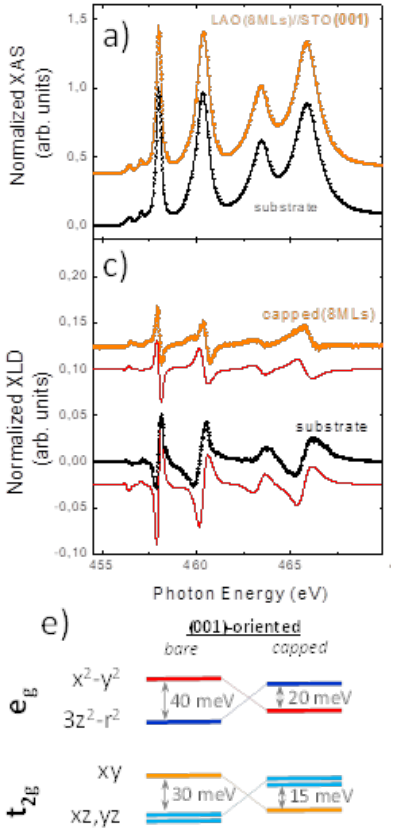
❑ Electron occupancy and orbital polarization

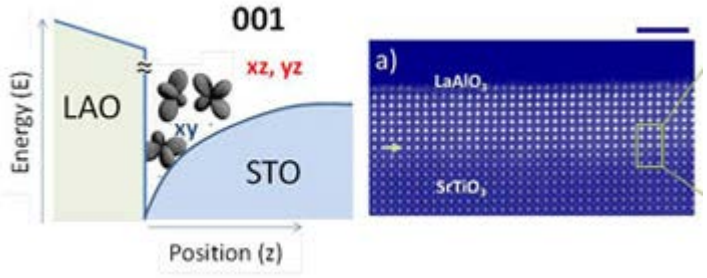
➢ EX. 1:Orbital occupancy at Ti-3d-t_{2g} in 2DEGs ($SrTiO_3/LaAlO_3$ interfaces)

XAS

XLD







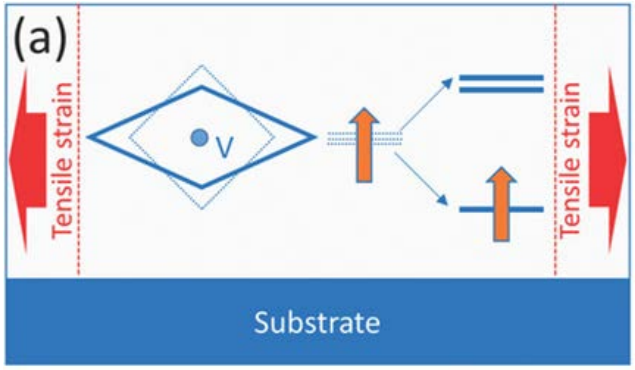
D. Pesquera, et al.

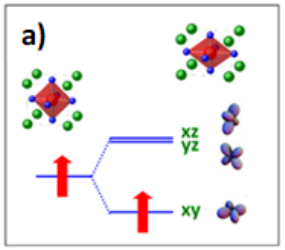
Phys. Rev. Lett. 113, 156802 (2014)

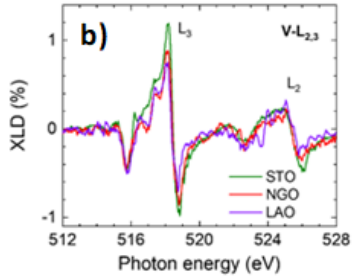
❑ Electron occupancy and orbital polarization

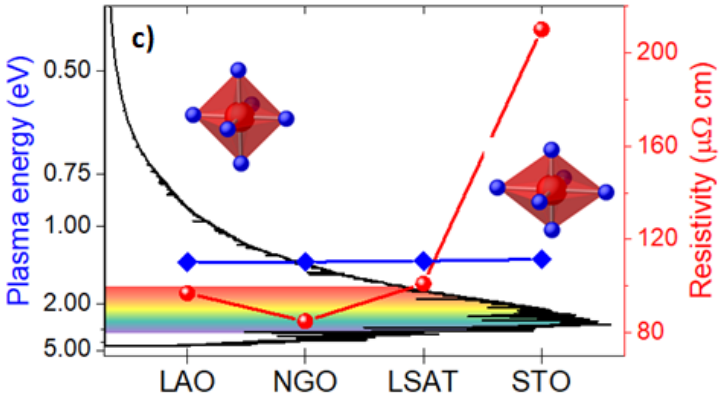
➢ EX. 3: Orbital occupancy and carrier effective mass at V-3d-t_{2g} in the transparent metal SrVO3.

$V4+ = 3d^1$







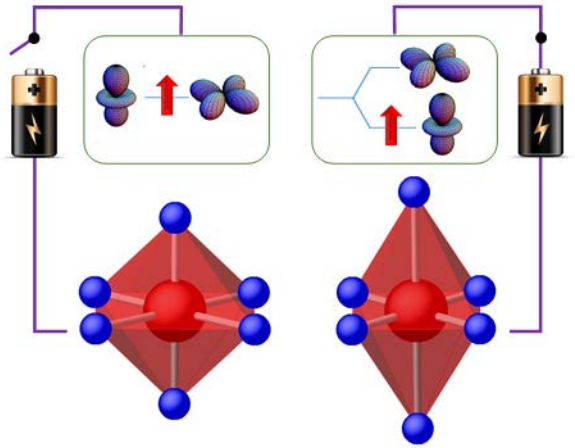


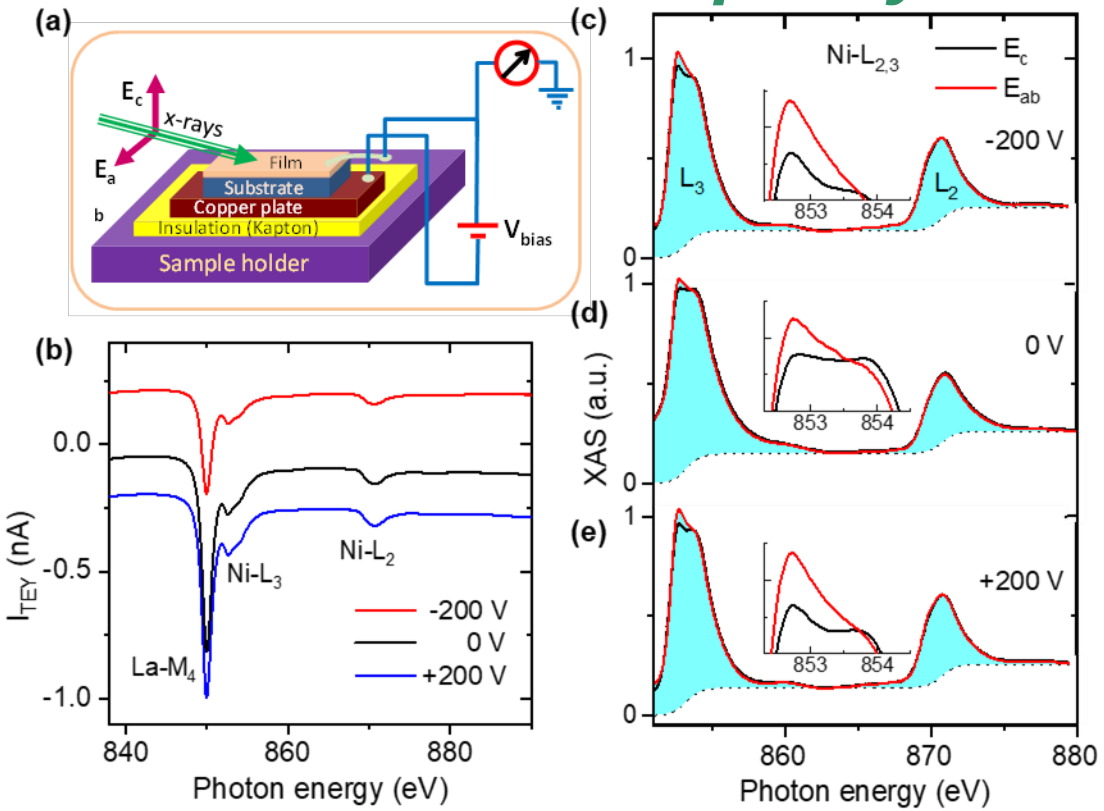
M. Mirjolet et al. Adv. Funct. Materials .2019 doi.org/10.1002/adfm.201904238).

M. Mirjolet, F. Sánchez, J. Fontcuberta, Adv. Funct. Mater. 2019, 1808432

❑ Electron occupancy and orbital polarization. In operando

➢ EX. 4: Voltage control of orbital occupancy at LaNiO3





H. B. Vasili et al. Accepted for publication (Phys. Rev. Materials 2020)

Scientific interests

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Experimental challenges and future projects

- Measure XAS, XLD and XM under external stimulus:
  - Electric fields (as the example (LaNiO3) above).
  - Charge currents
  - μw spin pumping
  - Synchronous excitation with ALBA burst

- Detection beyond TEY:
  - Fluorescence is probably a must.
  - Photoluminiscence of substrates

MULFOX-Boreas Cooperation
ALBA-ICMAB framework

- *The experimental facilities require for the above experiments are not easily accessible at most Synchrotron facilities or simply do not exist.*
- *The required equipment is either available or of very moderate cost. In-house design and construction.*
- *Dedicate manpower required (post.docs ?) and access time for testing.*
- *Full deliverables within 3 years.*

Thanks for your attention