UNL Department of Physics and Astronomy & The Nebraska Center for Materials and Nanoscience presents:

Electronic and Chemical Imaging of Nanomaterials

PRESENTED BY
MARIA ASENSIO,
Materials Science Institute of Madrid

THURSDAY
OCTOBER 14
4:00 PM
IN JH 136

Refreshments will be served in the JH 1st Floor Vending Area at 3:30

ABSTRACT

Nanoscience research and Nanotechnology have contributed significantly and even revolutionized diverse technology and industry fields like information technology, energy, medicine, transportation, environmental science, etc. The significant advances in these areas lead to faster, smaller, more energy-efficient, and more portable systems based on intelligent properties that pave the way for continuously evolving innovative applications. The main benefit of nanotechnology depends on the ability to tailor the structures and electronic properties of materials at extremely small scales to achieve specific properties. Nanotechnology can efficiently manufacture materials into stronger, lighter, more durable, more reactive electrical conductors, better insulators, or better electrical conductors, among many other characteristics. A critical problem in this field is determining the electronic structure of sub-micrometric materials precisely and directly.

Recently, remarkable progress has been achieved in modern microscopies. However, even if they have attained exceptional lateral resolution, the problem of providing a robust spectroscopic and electronic characterization of materials at the nano- and mesoscopic-scale remains. This gap has been recently filled by an innovative and powerful k-space nanoscope or NanoARPES (Nano Angle-Resolved Photoelectron Spectroscopy). This cutting-edge nanoimaging technique can determine the momentum and spatial resolved electronic structure, disclosing the implications of heterogeneities and confinement on the valence band electronic states typically present close to the Fermi level. The k-space nanoscope can be effectively combined with chemical imaging based on core levels (and their chemical shifts) scanning photoemission and X-ray absorption can detect even very tiny different chemical environments. In this

References

[1] Y. Chen et al., Advanced Materials., on line first (12/05/2018): (2018).

[2] H. Yi, et al., Appl. Phys. Lett. 112, 052102 (2018).

[3] Y. Ma, et al., Nature Communications 8 (2017) 14231.

[4] S.J. Gilbert, et al., ACS Appl. Mater. Interfaces. 12 (2020) 40525–40531. https://doi.org/10.1021/acsami.0c11892.

[5] K. Sakamoto, et al., Nano Lett. (2021) acs.nanolett.1c01100. https://doi.org/10.1021 /acs.nanolett.1c01100.

[6] V.L. Nguyen, et al, Nat. Nanotechnol. 16 (2021) 114–116. https://doi.org /10.1038/s41565-020-00821-z.

[7] M.E. Dávila, et al., Sci Rep. 11 (2021) 15034. https://doi.org/10.1038/s41598-021-94664-w.