Instituto Universitario de Investigación en Nanociencia de Aragón Universidad Zaragoza

ELECMI

LMA LABORATORIO DE MICROSCOPIAS AVANZADAS

# LMA SEMINARS

## Charge Transfer at the Single Molecule Level with Metal and Semiconductor Electrodes

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We have exploited STM based methods for making single molecule measurements on a wide variety of molecular targets from short molecular bridges, to redox active organometallic molecular wires and for complex supramolecular assemblies. Such measurements have been made as two-terminal determinations and also under electrochemical potential control with electrolytes varying from aqueous solutions to ionic liquids. Recently we have extended such measurements to semiconductor electrodes. In this lecture I will start by discussing charge transfer through single molecules at electrochemical interfaces and in particularly discuss how the electrochemical environment can influence charge transfer. I will then focus on recent results with semiconductor contacts. In a recent publication in Nano Letters [1] we have shown that it is possible to make measurements of single molecules connected at one end to gallium arsenide and at the other end to a gold scanning tunnelling microscope tip. Using this methodology we can record current-voltage response of semiconductor – molecule – metal devices and measure the electrical conductance of single molecules in such junctions. As well as showing that it is possible to form single molecule devices contacted to the semiconductor gallium arsenide we have also recently demonstrated that such single molecule devices show a strong photocurrent response.[2] The photo-current response in these molecular junctions can be controlled through the choice of the semiconductor and its doping density, the molecular bridge and also the light intensity and wavelength. To conclude potential future applications in single-molecule semiconductor (photo-) electrochemistry will be discussed.

References

[1] Vezzoli, A.; Brooke, R. J.; Ferri, N.; Higgins, S. J.; Schwarzacher, W.; Nichols, R. J. Nano Lett. 2017, 17 (2), 1109–1115.

[2] Vezzoli, A.; Brooke, R. J.; Higgins, S. J.; Schwarzacher, W.; Nichols, R. J. Nano Lett. 2017, acs.nanolett.7b02762.

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**12h - CONFERENCE ROOM**

**I+D BUILDING. CAMPUS RIO EBRO**