

## Designing new materials for solar cells via soft X-ray spectroscopy

F. J. Himpsel

Physics Department, University of Wisconsin Madison

This talk illustrates how spectroscopy with soft X-rays can assist the development of new materials and new designs for solar cells with better price/performance ratio. The starting point is the most general layout of a solar cell, which consists of a light absorber sandwiched between an electron donor and an electron acceptor. The relevant energy levels can be measured by a combination of X-ray absorption spectroscopy and photoelectron spectroscopy [1]. Examples for the design process will be given, such as organic dyes as absorbers, p-doped diamond films as inert donors, and the combination of all three components in one molecule (donor- $\pi$ -acceptor complexes [2],[3]).

[1] F. J.Himpsel et al., J. Electron Spectrosc. Relat. Phenom., published online (2012). <http://dx.doi.org/10.1016/j.elspec.2012.10.002>

[2] A. Yella, H.-W. Lee, H. N. Tsao, C. Yi, A. K. Chandiran, Md. K. Nazeeruddin, E. W.-G. Diau, C.-Y. Yeh, S. M. Zakeeruddin, M. Grätzel, Science **334**, 629 (2011).

[3] I. Zegkinoglou, M.-E. Ragoussi, S. C. Pemmaraju, P. S. Johnson, D. Pickup, J. E. Ortega, D. Prendergast, G. de la Torre, F. J. Himpsel, J. Phys. Chem. C **117**, 13357 (2013).