Materials Science and Engineering Department

Winter Seminar Series

Metal-Organic Interface at the Nanoscale – Correlating Binding Strength, Thermal Stability and Charge Transfer Properties

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3-4PM | Hill Seminar Room (LeBow 240)

Connecting inorganic and organic materials is mandatory for technologies supporting current development in electronics, biotechnology or new energy sources. This connection leads to the formation of an inorganic-organic interface which at the nanoscale becomes the most critical element of the device. Self-assembled monolayers (SAMs) provide simple and robust way for controlling organic-inorganic interface as indicated by this year Kavli Prize in Nanoscience. In this presentation we will focus on the contribution of the molecule-metal bonding to the structure, thermal stability and charge transfer across this interface using model systems based on thiols, selenols, carboxylic acids and carbenes. We will present an original experimental approach which we used to address this problem demonstrating for the first time the effect of positional oscillations in stability of the consecutive chemical bonds at the molecule-metal interface. As a next step we will analyze the consequence of this effect for the thermal stability of a model SAM systems. Finally, we will discuss how this effect can be related to the charge transport at the molecule-metal interface.

Dr. Piotr Cyganik received his PhD in physics from the Jagiellonian University (Kraków, Poland) in 2002. As a postdoc he spend almost 4 years working first at the St Andrews Univrsity (UK), and later as the Alexander von Humboldt fellow at the Bochum University (Germany). In the end of 2005 he received adjunct position back at his *alma mater* where he is now full professor of physics at the Department of Physics of Nanostructures and Nanotechnology. Together with his group of PhD and masters students he works on analysis of structure and properties of monomolecular organic films formed on a solid substrates. In his experiments he uses combination of microscopic, spectroscopic and spectrometric techniques and collaborates with other groups in USA (Harvard University) and Europe (Heidelberg University, Imperial College London, Jena University, Graz University). He is a coauthor of about 60 papers in this area of research which have been cited over 2100 times with the h-index of 27.

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