

Report CNR Short Term Mobility 2014

Federico Rosei, Professor and Director, Institut National de la Recherche Scientifique (Varennnes, QC, Canada)

During the short term mobility stay (June 11-25, 2014) at the Istituto di Struttura della Materia, CNR Tor Vergata, I worked closely with my host, Dr. Giorgio Contini, to further our collaboration on the surface confined polymerization of organic building blocks.

The basic concept that underwrites these studies is based on the observation that by confining the polymerization reaction to the surface, it is possible to create a polymeric sheet consisting of a periodic array of an aromatic building block. This stay helped consolidate several aspects of our recent work and of our collaboration in general, as detailed hereafter.

Following our plans, we performed preliminary experiments using LEED and XPS in Dr. Contini's laboratory at ISM, to complete our understanding of surface polymerization previously obtained through STM images in my laboratory in Montreal. Dr. Contini and I discussed these observations extensively and made comparisons to identify the role of substrate reactivity in the polymerization reactions. In particular, we aim to understand whether substrate reactivity plays an important role in ordering the intermediate organometallic species that form prior to the formation of covalent bonds. This specific aspect is crucial both for a fundamental understanding of the reaction mechanisms and because it influences the overall size of the final polymer product and its defect density, which in turn determines the quality of the material. Through these discussions we determined that further experiments will be required to better characterize the transition temperatures of the reactions and planned such experiments in detail.

In addition, until now our studies focused on different facets of copper surfaces; the analysis performed in the last two weeks indicated the importance of comparing results with other elements such as for example silver, gold and nickel. We expect that such comparisons will help understand the intermediate states of polymerization reactions, which in turn will lead to structural control of the final polymers and hopefully provide clues on how to synthesize extended conjugated sheets.

Finally, we thoroughly analyzed data that was recently acquired at synchrotron beamtime experiments in Trieste by my group members in collaboration with Dr. Contini. This analysis and discussion greatly helped us better understand the comparison, because of the higher resolution and overall better quality of synchrotron data, as well as the possibility of performing NEXAFS experiments that are not accessible in our respective laboratories (or in general from a laboratory source).

The stay was very fruitful and greatly contributed to further our collaboration.