Charge transfer processes in organic thin films and organic heterostructures of interest for photovoltaic applications

A. Morgante
CNR-IOM & Università di Trieste, Italy

The performances and efficiency of organic material based devices and in particular of photovoltaic cells are strongly affected by charge transfer processes at interfaces (organic-organic and organic-inorganic). To improve the device performances these processes and their correlation with the electronic structure of the interfaces must be understood. Spectroscopic studies based on synchrotron radiation experimental techniques of these hetero-structures will be presented, in particular the application of the Resonant PhotoEmission Spectroscopy (RPES) to various organic molecule based systems. The chemical specificity and the possibility to conduct experiments in the energy domain that provides a time scale for charge dynamics, make the RPES a powerful tool to study organic heterojunctions and in particular to probe the charge transfer processes at organic interfaces. The models used in RPES data analysis to extract the time scale of the excited charge delocalisation and the spatial correlation of core, valence occupied and unoccupied molecular states will be briefly discussed. The application of RPES and other spectroscopic techniques to various interfaces will be reported. The case of ammine terminated organic overlayers will be discuss in connection with recent results of break junction experiments. Measurements carried out on ammine terminated organic molecules have been shown to provide for the first time reliable conductance measurements results. The comparison of RESPES and break junction experiments could elucidate the link between the quantum and the meso-scopic properties of organic-inorganic interfaces.