The 938th IMS colloquium
since 1976

Single Molecule Switching and Sensing

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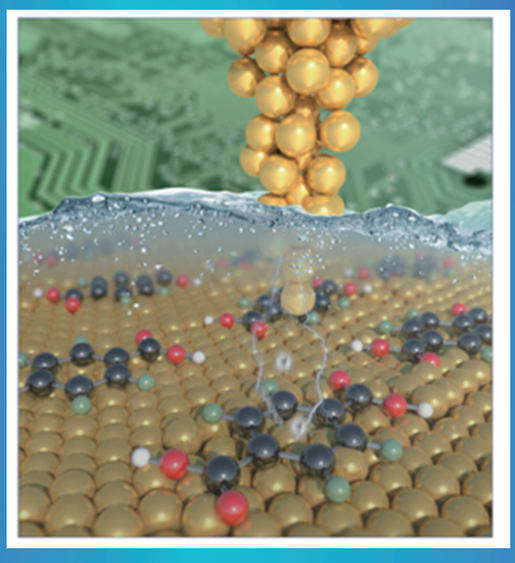
Date & Time: 2020/1/8 (Wed.) 16:00-
Place: IMS Research Building Room 201
This colloquium will also be held as a Morino lecture.

Charge transport through and between molecules is central to important processes in nature. Studying the conductivity of single molecules can contribute to a better understanding of charge transport, and also help develop building blocks of molecular electronics, light harvesting devices, etc. We use the Scanning Tunneling Microscope break-junction (STM-BJ) method to repeatedly form circuits where one or a few molecules are trapped between two electrodes, at least one of which has nanoscale dimensions. The statistical analysis of thousands of measurements yields the conductance of single molecules.

One particular interest is the role of the molecule-electrode contact in charge transport. In the simplest analysis this contact can present a substantial barrier to charge injection, which can have important consequences in devices such as dye sensitized semiconductor nanoparticle solar cells. We have demonstrated that carbodithioate termination of molecules can enhance conductivity by an order of magnitude. We have also shown how the sensitivity of the electrical conductivity of single molecules to external perturbations can allow for switching and sensing, as well as the use of single molecule conductance for the discovery of novel materials. Our most recent developments include controlling the orientation of the molecule in the junction using the electrode potential so that we can measure charge transport along different molecular axes, accessing elements of the single molecule conductivity tensor.



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