Building Molecular Diodes from Redox Active Proteins Absorbed on Self-Assembled Monolayers

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ABSTRACT
The first molecular diode was proposed by Ratner and Aviram in 1974, but many theoretical and experimental studies showed that molecular diodes perform well in terms of rectification ratios *R* (the current at one given bias divided by the current at opposite bias) larger than 10, that can be generated in high yields and with high reproducibility, are rare. For molecular electronics to continue to evolve, here we use the different terminal groups of self-assembled monolayers (SAMs) to control the supramolecular structure of the protein molecule cytochrome *c* (cyt *c*, with a heme group as a redox centre) absorbed on top of the SAMs to achieve current rectification in two order of magnitudes of *R* with high yield and reproducibility. The angular dependent X-ray photoelectron spectroscopy is used to determine the thickness of the cyt *c*/SAM architecture, the surface coverage of cyt *c* molecules and the positions of heme groups respected to bottom-electrodes. We find the performances of these molecular diodes are dependent on the supramolecular structure and orientation of the cyt *c* molecules.

BIOSKETCH
Dr. Yuan Li currently is a postdoc in Prof. George Whitesides's group in Chemistry and Chemical Biology department of Harvard University. He received a B.S. degree in Chemical Engineering from Zhejiang University in China, and the M.S. degree in Chemistry from Eindhoven University of Technology in the Netherlands. In 2016, he obtained his Ph.D. degree in Chemistry from National University of Singapore. His research is focused on the study of charge transport through self-assembled monolayer (SAM) and using different structural and electrical characterization techniques to understand the role of the supramolecular structure in the performance of the molecular electronic devices.