Molecular Electronics for Chemical Sensors

This lecture will detail the creation of ultrasensitive sensors based on electronically active conjugated polymers (CPs) and carbon nanotubes (CNTs). A central concept that a single nano- or molecular-wire spanning between two electrodes would create an exceptional sensor if binding of a molecule of interest to it would block all electronic transport. Nanowire networks of CNTs provide for a practical approximation to the single nanowire scheme. A number of functionalization routes to create selective sensors for small molecules as well as biomolecules will be presented. New methods for fabrication using solventless deposition methods will be described that allow for economical flexible sensor fabrication. These methods include abrasion deposition and selectivity is generated by covalent and/or non-covalent binding selectors/receptors to the carbon nanotubes. Sensors for a variety of materials and cross-reactive sensor arrays will be described. The use of carbon nanotube based gas sensors for the detection of ethylene and other gases relevant to agricultural and food production/storage/transportation are being specifically targeted.

References