

# Molecular Electronics for the Creation of High-Performance Chemical Sensors

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This lecture will detail the creation of ultrasensitive sensors based on electronically active conjugated polymers (CPs) and carbon nanotubes (CNTs). A central concept is 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. The use of molecular electronic circuits to give signal gain is not limited to electrical transport and CP-based fluorescent sensors can provide ultratrace detection of chemical vapors via amplification resulting from exciton migration. Recent results will detail the detection of perfluoroalkane substances (PFAS) by two separate methods exploiting our understanding of the energy transport mechanisms. Nanowire networks of CNTs provide for a practical approximation to the single nanowire scheme. 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 toxic chemicals as well as ethylene and other gases relevant to agricultural and food production/storage/transportation. Time permitting, I will also detail the use of conducting polymers to create new generations of biosensors.

