New Method Creates Nanowire Detectors Exactly Where Needed

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There seems to be little doubt among cancer researchers that new detection systems using nanowires and microfluidics hold the promise of providing a quantum leap in the detection of cancer-related molecules and genes. However, researchers also know that there are significant technical barriers that must be overcome to realize that promise, including the current difficulty in creating microfluidic devices built around nanowire detectors.

Now, a team of investigators at the Nanosystems Biology Cancer Center, one of eight NCI-funded Centers of Cancer Nanotechnology Excellence, has developed a method for creating conducting polymer nanowires in place within microfluidic circuits.

The team, led by Hsian-Rong Tseng, Ph.D., of the University of California, Los Angeles, and James Health, Ph.D., of the California Institute of Technology, reported their work in the journal *Chemical Communications*.

The researchers create the nanowires using standard microelectrodes built into the microfluidics device specifically for the purpose of carrying out electrochemical reactions within the channels of the device. This allows them to use the microfluidic channels to introduce the precursor molecules, or monomers, needed to create the conducting polymer nanowires and trigger an electrochemical reaction at the exact place where the nanowires are needed to function as biomolecule detectors. This reaction causes the monomers to link to one another,

forming the conducting polymer nanowires. This process can create two different types of polymer nanowires, one made of polyaniline, the other of polypyrrole. The chemical reactions are completed within 40 minutes.

Once formed, the nanowires can function immediately as detectors, with the electrodes used to form the nanowires now functioning as the circuitry that connects the nanowires to electrical signal recorders. The investigators demonstrate that these detectors are highly sensitive to changes in pH and to changing ammonia concentrations, though they note that these nanowires should be able to be used to detect a wide range of biomolecules.

This work, which was supported in part by the National Cancer Institute, is detailed in a paper titled, “Electrochemical fabrication of conducting polymer nanowires in an integrated microfluidic system.” An abstract of this paper is available through PubMed.

Source: National Cancer Institute