Nanofiber Sensors Detect Cancer Faster

New research suggests that smartphone users could diagnose serious diseases, such as diabetes or lung cancer, quickly and effectively by simply breathing into a nanofiber breathing sensor mounted on the phones. Il-Doo Kim, Associate Professor of Materials Science and Engineering Department at the Korea Advanced Institute of Science and Technology (KAIST), and his research team have recently published a paper entitled *Thin-Wall Assembled SnO2 Fibers Functionalized by Catalytic Pt Nanoparticles and their Superior Exhaled Breath-Sensing Properties for the Diagnosis of Diabetes*, in an academic journal, *Advanced Functional Materials*, on the development of a highly sensitive exhaled breath sensor by using hierarchical SnO2 fibers that are assembled from wrinkled thin SnO2 nanotubes.

The breath analysis for diabetes is largely based on an acetone breath test because acetone is one of the specific volatile organic compounds (VOC) produced in the human body to signal the onset of particular diseases. In other words, they are biomarkers to predict certain diseases such as acetone for diabetes, toluene for lung cancer, and ammonia for kidney malfunction. Breath analysis for medical evaluation has attracted much attention because it is less intrusive, fast, convenient and environmentally friendly, leaving almost no biohazard wastes.

Various gas-sensing techniques have been adopted to analyze VOCs including gas chromatography-mass spectroscopy (GC-MS), but these techniques are difficult to incorporate into portable real-time gas sensors because the testing equipment is bulky and expensive, and their operation is more complex. Metal-oxide based chemiresistive gas sensors, however, offer greater usability for portable real-time breath sensors.

The exhaled acetone level of diabetes patients exceeds 1.8 parts per million (ppm), which is two to six-fold higher than that (0.3-0.9 ppm) of healthy people. Therefore, a highly sensitive detection that responds to acetone below one ppm, in the presence of other exhaled gases as well as under the humid environment of human breath, is important for an accurate diagnosis of diabetes. In addition, Professor Kim said, "a trace concentration of toluene (30 ppb) in exhaled breath is regarded to be a distinctive early symptom of lung cancer, which we were able to detect with our prototype breath tester."

The research team has now been developing an array of breathing sensors using various catalysts and a number of semiconducting metal oxide fibers, which will offer patients a real-time easy diagnosis of diseases.