

## **Metal nanoparticle/polymer/carbon nanotube hybrid materials for highly sensitive and selective volatile organic compound detection**

Nowadays, air pollution is an important problem in human health and the environment. The main causes of this problem are the toxic chemicals and waste released from various industries, especially volatile organic compound (VOC). Several nanostructured materials such as carbon nanotube (CNT), has attracted considerable attention as alternative sensing materials because of their distinctive characteristics in structural, electrical and mechanical properties. We propose the hybrid materials based on metal nanoparticle (NP) and polymer-functionalized single-walled CNT (SWCNT) for highly sensitive and selective VOC detection. The hybrid metal NP/polymer/CNT was exposed to dichloromethane, chloroform and benzene vapors. The hybrid palladium NP/ethyl cellulose/SWCNT enabled an approximately 8-fold in benzene detection, while platinum NP/ethyl cellulose/SWCNT enabled an approximately 71- and 194-fold in chloroform and dichloromethane detection, respectively compared to the pristine SWCNT. The sensing mechanism of the hybrid metal NP/polymer/SWCNT was explained by polymer swelling and catalytic oxidation on the metal NPs catalyst surface. With the selection of polymer coating and metal NP decoration, the sensitivity and selectivity of the sensor were successfully improved. These results suggest that the integration of pristine SWCNT with polymer and metal NP is a promising approach for highly sensitive and selective VOC detection.