TOWARDS AN ELECTRONIC NANO-NOSE FOR ON-SITE REAL-TIME DETECTION OF HAZARDOUS GASES

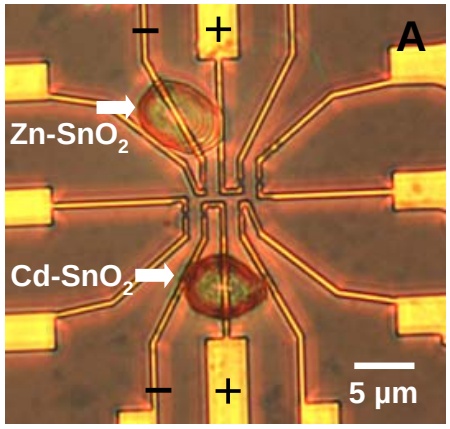
M. Su, S. Li, V.P. Dravid; "Smart Miniaturized Chemical Multiplexed Sensor Array," J. Am. Chem. Soc. **2003**, 125(33), 9930-9931.

U.S. Patent Application, "*Miniaturized Semiconductor Sensors Fabricated by DPN Using Sol-Inks,"* filed 2/18/04. NU 22101, V.P. Dravid, M. Su.

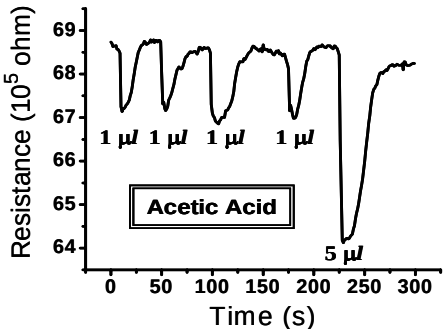
The requirements for on-site detection of hazardous gases call for integrated sensors with ultra-fast sensing, rapid recovery, and high selectivity – almost behaving like an electronic nose.

The group combined the site- and shape-specificity of the dip-pen nanolithography (DPN) approach and the versatility of sol-based precursor inks, to fabricate arrays of nanodisk inorganic sensors. Nanodisks are directly deposited in-between prefabricated electrodes, facilitating the direct measurement of a sensor response in real-time and provide an aid to on-site detection.

The nanodisk sensors show rapid response and ultra-fast recovery for oxidative (e.g., nitrogen dioxide) and reducing (e.g., acetic acid) species, and model simulants for sarin and related species. Based on the principle of pattern recognition of the olfactory system, an electronic nose that can "smell" different species has been demonstrated. The gas recognition ability, instant response and rapid recovery, compact size, and integration with the established microelectronics platform make the nanodisk arrays a significant development for on-site and real-time detection of life-threatening gases.



DPN-generated doped SnO_2 nanodisk sensor array fabricated in-between measurement electrodes.



Sensing performance of SnO_2 nanodisk sensors for acetic acid vapor. Note the rapid response, ultra-fast recovery and repeatability of this versatile sensor.