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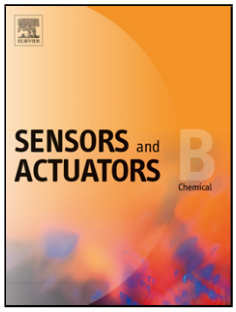

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PII: S0925-4005(15)30216-1
DOI: http://dx.doi.org/doi:10.1016/j.snb.2015.08.038
Reference: SNB 18893

To appear in: *Sensors and Actuators B*

Received date: 2-6-2015
Revised date: 24-7-2015
Accepted date: 9-8-2015

Please cite this article as: S. Nag, A. Sachan, M. Castro, V. Choudhary, J.F. Feller, Spray layer-by-layer assembly of POSS functionalized CNTquantum chemo-resistive sensors with tuneable selectivity and ppm resolutionto VOC biomarkers, *Sensors and Actuators B: Chemical* (2015), http://dx.doi.org/10.1016/j.snb.2015.08.038

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Spray layer-by-layer assembly of POSS functionalized CNTquantum chemo-resistive sensors with tuneable selectivity and ppm resolutionto VOC biomarkers

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Abstract: The analysis of volatile organic compounds (VOC) emanating from the human body, the volatolome, gives an idea of the metabolic and physiological functions of an individual and can provide non-invasive, cost effective anticipated diagnosis of several diseases including cancer.A novel way to control the disconnection of the nano-junctions of the percolated conducting network in chemo-resistive sensors composed of different polyhedral oligomericsilsesquioxanes (POSS) covalently and non-covalentlybondedto the surface of functionalized CNT has been investigated. The resulting series of quantum resistive sensors (QRS) of different nano-junctions' gap and chemical selectivitythat has been assembled intoan array (e-nose), and submitted to a set of lung cancer VOCbiomarkers,show very good discrimination ability and a ppm level resolution even in the presence of 50% of moisture.In particular one sensor was found highly selective to acetone, which is a biomarker of diabetes and lung cancer, whereas another sensor was more selective to cyclohexane,which is a biomarker of malignant pleural mesothelioma and lung cancer. Therefore, it is expected that such QRS judicially exploited can meet biomedical applications such as anticipated diagnostic of cancers by the analysis VOCfrom the volatolome.

Keywords: Hybrid functional nanomaterials; Quantum Resistive Sensor; VOC; Anticipated Diagnosis; Electronic nose; POSS; CNT; Cancer biomarkers;Moisture;

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