**Quantum Resistive Sensors made of Graphene and Metal Organic Frameworks for VOC biomarkers Analysis**

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***Abstract:***

The work explores the high-performing volatile organic compounds (VOCs) chemoresistive sensors with tuneable sensitivity and selectivity by combining pristine graphene (pG) and metal organic frameworks (MOFs). The synergistic effect achieved from the novel composites of graphene, a highly conductive material with limit chemical vapour sensitivity, with different MOFs, low conductivity but high gas/vapour sensitivity. The sensing characteristics of pG composite with different MOFs including copper–benzene-1,3,5-tricarboxylate (pG-Cu–BTC), zirconium 1,4-dicarboxybenzene (pG-UiO-66) and 2-methylimidazole zinc salt (pG-ZIF-8), were explored to tune their selectivity and capability for distinguishing different VOC biomarkers (e. g, methanol, ethanol, acetone, chloroform and toluene) at room temperatures. Results show that among graphene-MOF sensors, the pG-Cu–BTC sensor shows the highest sensing response towards tested VOC biomarkers. The sensor is selectively response to chloroform and methanol vapour at 2 to 24 ppm level. Therefore this is of great significance for human health monitoring based on bio-interfaces of nanoscale sensing materials and VOC biomarkers that released from metabolic human breath. This can be established using nanosensor array for affordable, low-cost and direct non-invasive biomedical diagnostic system.



Figure 1. Graphical presentation of proposed graphene-MOF nanosensor for non-invasive biomedical diagnostics based on breath biomarkers analysis.

**Keywords:** *Graphene, graphene-MOFs, graphene composite, chemical sensors, VOC analysis*

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