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Abstract

Room Temperature Chemoresistive Gas Sensor Based on Organic-Functionalized Graphene Oxide †

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In the wide palette of chemoresistive sensing materials, hybrid nanocomposites have quickly gained a prominent position. So far, the research focused on graphene-based materials has led to an extensive assortment of highly performing devices. Graphene Oxide (GO) nanosheets possess quite a large number of hydrophilic groups, such as hydroxyl, epoxy and carboxyl on the basal plane. Epoxy groups provide some active sites for chemical reactions such as the nucleophilic addition. Cyclic aza-ethers can easily react with the epoxy sites on the GO surface, resulting in the formation of carbon-nitrogen covalent linkage. FGO nanosheets were synthetized and deposited by drop-casting onto alumina substrates with interdigitated gold electrodes, producing a series of thick-film gas sensors. SEM, XRD, TEM, IR and XPS analyses were performed on the obtained nanosheets, confirming the functionalization reaction. Among the several gases tested, the FGO films turned out to be selective to humidity. A deepened electrical characterization at room temperature showed that the response and recovery times depend on the humidity concentration as far as the response value. Furthermore, the sensing performance is dependent on the graphene:ether rate. The diverse FGO devices show great stability and repeatability over time, confirming that the cyclic ether acts as a receptor in the sensing mechanism.