Disclosing the Sensitivity and Selectivity of Metal Oxide/Graphene Oxide-based Chemoresistors Towards VOCs

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The development of high-performing sensing materials, able to detect ppb-trace concentrations of volatile organic compounds (VOCs) at low temperatures and in the presence of interfering species, is required for the development of next-generation miniaturized wireless sensors [1-3]. Herein, we present the engineering of highly sensitive chemical sensors, comprising of different Metal Oxide Semiconductors (MOS as ZnO, SnO_2 and TiO_2) layouts [4,5]. Moreover, in order to enhance the selectivity, SnO_2-TiO_2-GO solid solutions were synthesized via a simple hydrothermal route, varying the titanium content in the tin dioxide matrix in the case of solid solutions. The toluene and acetone gas sensing performances of the as-prepared sensors were systematically investigated. Interestingly, at 350 °C, as $Sn_{0.55}Ti_{0.45}$-GO showed promising sensing behavior towards bigger and non-polar gaseous molecules, such as toluene. In particular, these solid solutions seem to be much more selective towards this species rather than acetone one; even if, in both cases, hundreds of ppb concentrations were detected. Conversely, at either high or room temperature conditions, SnO_2-GO showed a higher selectivity towards more polar molecules, as acetone ones. Hence, we believe that these findings can provide guidelines for the engineering of the next generation of miniaturized chemoresistive sensors for selective room-temperature detection of various VOCs.

References

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