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Individual CdS-covered aerographite microtubes for room temperature VOC sensing with high selectivity

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Abstract

The synthesis of new nanomaterials with a large surface-to-volume ratio is of high interest for sensing applications, and especially for gas sensors with high performances. In this work, a thin layer of CdS is deposited onto tubular graphitic/aerographite microstructures using RF magnetron sputtering for further integration into sensing devices using a FIB/SEM system. The quality of the deposited layers as well as microstructural features were analyzed by transmission electron microscopy and energy dispersive X-ray spectroscopy. The gas sensing measurements at room temperature demonstrated the excellent sensing properties towards vapors of volatile organic compounds (VOCs), such as ethanol, acetone, 2-propanol and *n*- butanol. The superior properties were attributed to the nanometer thickness (20–30 nm) and high surface-to-volume ratio of CdS thin layers as a result of the tubular structure of wrinkled Aerographite (AG). This causes a big number of gas sensitive potential barriers between particles, resulting in a high sensor response. This makes mesoporous graphitic/aerographite microtubes ideal construction blocks for the formation of hybrid materials and for their use in gas sensing applications. The presented strategy can be also applied to other materials with high performance gas sensing properties.