An optimized measurement algorithm for gas sensors based on carbon nanotubes: optimizing sensor performance and hardware resources

This work presents a novel algorithm for the measurement of resistive-type gas sensors with carbon nanotubes (CNTs) as sensitive layer. Contrary to conventional strategies, which extract the sensor information from the normalized resistance, the proposed algorithm is based on the variation in resistance over time. The results have demonstrated that the time necessary to get the maximum performance of these sensors is reduced around a 25% when compared with the conventional approach for any of the recovery strategies analysed (passive desorption, external heating or DC voltage). The hardware implementation of the proposed algorithm in a field-programmable gate array (FPGA) has also demonstrated that, in addition to optimizing the sensor performance in terms of time response and sensitivity, this measurement algorithm yields a significant minimization of the sensor readout circuit resources at both software and hardware levels paving the way for future development of smart sensors for the Internet of Things (IoT) applications.

Stichworte: CNT, FPGA, inkjet printing, NH3, single-walled, recovery, spray deposition