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Low powered, tunable and ultra-light aerographite sensor for climate relevant gas monitoring

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Abstract

Increasing atmospheric CO2 gas pollution and emergence of new types of green energy sources require continuous environmental monitoring. In this context, fast, efficient, light, robust, and reliable gas sensors that can work at room temperature are in high demand. We report on a low-powered type of ultra-light sensor, based on a 3-D-microtube network from a 2-D graphene/nanographite, called aerographite, and a method to tune the nanosensor's selectivity by a simple variation of the applied bias voltage. Adequate selectivity to CO2 and ultra-fast sensing of H2 by applying 1 V and 5 V, respectively, is obtained. At ultra-low applied bias voltages (1–100 mV) only very low power consumption (≈3.6 nW for 1 mV) is needed. This is most important, as it can be run by energy harvesting methods. The presented results are of the highest interest in terms of low-cost production of ultra-light and ultra-low-power consumption gas sensors for environmental monitoring of greenhouse gases and their simplicity from the technological/engineering points of view.