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Title: Sensor Array on Nanowires CuO/Cu_2O/Cu Heterojunction Net

Abstract
In this work, for the first time, acetone sensors based on nanowire CuO/Cu_2O/Cu heterojunctions have been designed, obtained and investigated using the single-stage 3D printing method. By thermal oxidation of Cu microparticles with a diameter of 11-24 μm on the glass substrate at 425 °C for 1.5-2.5 hours in air, it was possible to obtain non-planar heterojunction stripes of CuO/Cu_2O/Cu and fully covered on the surface of the microparticles with 15-20 nm nanowire thick network. The high crystallinity of the nanowire stripes and the heterojunctions of CuO/Cu_2O/Cu was demonstrated, as well as the growth of CuO nanowires on the surface of the microparticles through morphological, vibrational, chemical and structural investigations. One of the important results is the excellent selectivity for acetone vapors at an operating temperature of 350 °C, with a high gas response of approximately 150% at 100 ppm. Due to the controllable production technology, the fast detection sensing properties of acetone vapor and low power consumption, these 3D-printed devices ideal candidates for fast detection, as well as acetone vapor monitoring (down to 1 ppm). This developed approach will give the possibility to expand in production or development for many different devices through the simplicity and versatility of the manufacturing method for electronic and biomedical applications, such as exact detection of acetone vapor in different atmospheres.