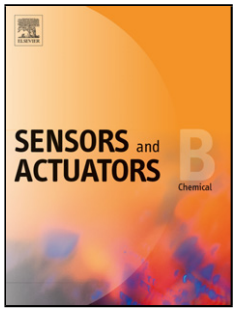

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Facile microwave-assisted hydrothermal synthesis of varied-shaped CuO nanoparticles and their gas sensing properties

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Abstract

In this work, CuO nanoparticles of varying shape (tadpole-shaped, spindly, leaf/sphere-like and fusiform) have been prepared by a facile microwave-assisted hydrothermal (MH) method. The products were characterized by X-ray powder diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR) and transmission electron microscopy (TEM). XRD and TEM results revealed pure phase monoclinic CuO nanoparticles with uniform shapes and sizes. FT-IR and UV-vis measurements of these nanoparticles with varying shape showed a highly shape-dependent nature. The gas sensing performance of the obtained nanoparticles was analyzed by detection of target gases, including methanol, ethanol and acetone at 220°C. The tadpole-shaped CuO nanoparticles displayed the best response of ~5 to 1000 ppm methanol, ~7 to 1000 ppm ethanol, and ~8 to 800 ppm acetone, respectively. All these CuO-based sensors exhibited a relatively higher response to acetone when compared to their response toward methanol and ethanol. The enhanced sensing performance of the tadpole-shaped CuO sensor may be attributed to their unique shape and small size, which is more favorable in rapid and efficient diffusion of organic vapors