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ZnO-CuO core-shell heterojunction nanowires for optoelectronic applications

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Nowadays, core-shell nanowires have attracted a great scientific interest due to their unique physical properties and advanced functionalities leading to applications in optoelectronic area [1]. Combining ZnO, an n type semiconductor with a band gap of 3.3 eV [2] and CuO, an p type semiconductor with a band gap of 1.2 eV [3], into core-shell radial heterojunction nanowires, a type II heterojunction alignment can be acquired, with a good control of the separation and recombination of the charge carriers at the interface between the two semiconductors.

In this context, the ZnO-CuO core-shell heterojunction nanowire arrays were synthesized by thermal oxidation in air and radiofrequency magnetron sputtering (Figure 1). The ZnO-CuO core-shell nanowire arrays were investigated by the morphological, structural, optical, compositional and surface chemistry point of views. In order to assessed their optoelectronic properties, individual ZnO-CuO core-shell nanowires were contacted using photolithography, electron beam lithography and thin film deposition techniques. Exhibiting a rectifying behavior (Figure 2), typical for n-p diodes, these single ZnO-CuO core-shell nanowires can be used in UV photodetectors applications, such as radiation detection, air purification, advanced communications etc.

Keywords: *core-shell, nanowires, optoelectronic, ZnO-CuO.*

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Conflicts of Interest

The authors declare no conflict of interest.

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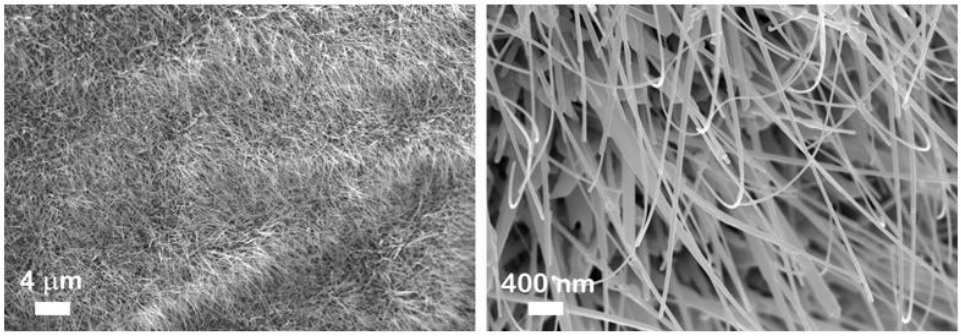

Figure 1. FESEM images at two magnifications of the ZnO-CuO core-shell heterojunction nanowire arrays.

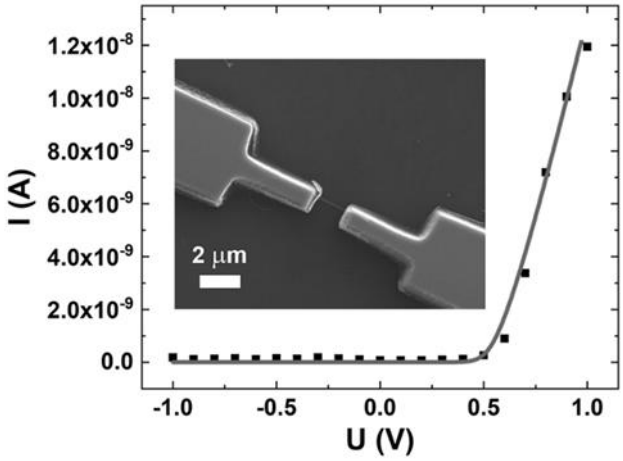

Figure 2. Current-voltage characteristic (black squares) and theoretical fitting (solid curve) of a single ZnO-CuO core-shell radial heterojunction nanowire contacted by electron beam lithography. Inset: FESEM image a single contacted ZnO-CuO nanowire.

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