All Layers Inkjet-printed Field Effect Transistors using p-CuO Nanoparticles Based Ink-formulation

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Copper oxide (CuO) nanoparticles (NPs) having 5-8 nm in diameter were synthesized by a simple solution process. The as-synthesized NPs showed highly crystalline monoclinic phase of CuO with having bandgap of ~1.75 eV. The CuO NPs were further formulated as an ink using mixed solvents of water, ethanol, isopropanol and diethylene glycol for inkjet printing of CuO field effect transistors (FETs). The ink-jetting behavior of the as-formulated ink samples showed that the CuO concentration and digitally-controlled number of over-printing are important factors for optimizing the uniformity and thickness of printed films with smooth edge definition. In this report, we present the first results of inkjet printed CuO (channel) and Cu (source/drain) based field effect transistors (FET) on Si/SiO2 (gate material) substrate. As-printed devices show p-type conductivity with high carrier mobility, which can be applied further for various applications.