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Structure and morphology of nanoporous zno and dark current-Voltage characteristics of the glass/(TCO)/zno/poly[2,7-(9,9-dioctylfluorene)-alt-(5,5'-bithiophene)/ag structure

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Abstract

The hybrid organic-inorganic structure based on glass/(TCO)/nanoporous ZnO/poly[2,7-(9,9-dioctylfluorene)-alt-(5,5′-bithiophene)]/Ag that was prepared by physical deposition has been investigated. The structure of the nanostructured ZnO obtained by magnetron sputtering was confirmed by X-ray diffractometry (XRD) and energy dispersive X-ray spectroscopy (EDX). Scanning electron microscopy (SEM) analysis proved the existence of short and interconnected zinc oxide (ZnO) fibers, which form a continuous porous network with pores having an average diameter of 100 nm. Current-voltage (I-V) curves of the glass/TCO/ZnO/PF-BT/Ag hybrid structure are similar to those of typical p-n junctions and stable until 90°C temperature. According to the I-V characteristics, the dominant mechanism of current flow is based on the generation-recombination of carriers in the depletion region at low direct biases and also on the injection of carriers at high biases. The reverse branch of the I-V characteristic, calculated in log-log scale, shows one segment with a power coefficient of 3/2 at room temperature.