

Electrical properties of ZnO nanowires based field effect transistors fabricated by top-gate and back-gate approaches

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A comparison between the electrical properties of ZnO nanowire based field effect transistors fabricated by top-gate and back-gate approaches has been presented in this paper. The field-effect transistors were fabricated by electron-beam lithography and photolithography process using ZnO nanowires grown by thermal evaporation process. The electrical properties of the fabricated ZnO nanowire based FETs were examined by V_{ds} - I_{ds} and V_{gs} - I_{ds} measurements. A good contact between ZnO nanowires and Ti/Au metal electrodes was achieved for the fabricated FETs. It was observed that the peak transconductance for the fabricated top-gate ZnO FETs was 162 ns while the peak transconductance for the back-gate based ZnO FETs was 92 ns. The field effect mobilities (μ_{eff}) for the top gated and back gated based ZnO nanowires FETs were 72 and 7.1 $cm^2/V\cdot s$, respectively. Our approaches present that the top-gate ZnO nanowires FETs have good electrical characteristics as compared to the back-gated ZnO nanowires FETs.