Single ZnO Nanowire Based Field Effect Transistors (FETs) Fabricated by Back- and Top-Gate Approaches

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The electrical properties of single ZnO nanowire were examined by fabricating single nanowire based field effect transistors (FETs) via two approaches, i.e. back- and top-gate approaches by using electron beam lithography (EBL) and photolithography processes. The ZnO nanowires were synthesized by non-catalytic simple thermal evaporation process by using metallic zinc powder in the presence of oxygen. The as-grown ZnO nanowires were characterized in terms of their structural and optical properties which confirmed that the grown nanowires are well-crystallized with the wurtzite hexagonal phase and exhibiting good optical properties. The peak transconductances of the back- and top-gate FETs were ~3.2 and ~7.4 nS, respectively. The field effect mobilities (μ_{eff}) for the back- and top-gate FETs were measured to be 3.4 and 7.87 $cm^2/V•s$, respectively. Our studies conclude that the fabricated top-gate FETs exhibited higher and good electrical properties as compared to ZnO nanowire FETs fabricated using back-gate approaches.