

Study on solution-gating effects of nanowire field effect transistors fabricated by top-down method

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The semiconductor nanowire devices have been demonstrated successfully for wide applications of chemical and biological sensors. Their fabrication methods are still based on bottom-up approaches due to cost-cost synthesis, but suffer from absence of mass producible technology. To address this issue, we developed a cost effective top-down approach to fabricate nanowire field-effect transistors (FETs). Based on this approach, it was revealed that the ZnO nanowires fabricated in this work could have various cross-sectional shapes such as semicircle, triangle and nanodot-embeded shape with variation of process conditions. First, we investigated their electronic properties such as threshold voltage, mobility, and back-gating effects. Then, solution-gating effects of nanowire FETs according to various cross-sectional shapes have been researched for purpose of evaluating their performance as chemical and biological sensors. This work will play an important role in developing cost effective nanowire device for wide applications of nanowire devices chemical and biological sensors.