Cost-effective fabrication route of nanowire field effect transistor toward chemical and biological sensors

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Nanowire field effect transistors (NWFETs) have attracted strong research interests as one of the most outstanding platforms in the field of chemical and biological sensors. Although these techniques have made valuable contributions to the related research fields, their use on a large scale still remains a significant challenge due to their high cost or low throughput. To address these issues in this work, metal oxide NWFETs were fabricated by a cost-effective top-down technique that consists of sequential processes of metal oxide deposition, nanoimprint lithography and low-damage dry etching. Based on the optimized device fabrication route, it is demonstrated that the NWFETs developed in this work can be applied directly to real-time detections of chemical and biological species. Finally, various aspects in terms of chemical and biological sensing behaviors were compared to the conventional bottom-up based NWFETs with high performance.