Nano-imprinted nanowire device coupled with plasma process for chemical and biological sensors

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Semiconductor nanowire field effect transistors (NWFETs) have attracted strong research interest as a platform for the construction of chemical and biological sensors. Despite a wide range of potential applications, development of the cost effective and mass-producible fabrication routes remains a significant challenge. To address these issues, we developed a novel fabrication method based on plasma processing of etching and deposition, consisting of sequential processes of metal oxide (ZnO) deposition, nano-imprint lithography, low-damage plama etching, and non-thermal plasma deposition. This works demonstrates that the benefits of plasma process play a great role in finding breakthrough of the conventional nanobiosensor. Based on plasma processes compatible with conventional semiconductor processes, a novel process is proposed for cost effective fabrication of mass producible NWFET biosensor. Furthermore, it is demonstrated that the optimized ZnO NWFET device with effective surface functionalization (a-Carbon, Teflon-like Carbon) can be good alternative for the functionalization platform of the conventional NWFET sensors.