

### 3D simulation of electrolyte-gated nanowire field effect transistor for chemical and biological sensor applications

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Until now, the semiconductor nanowire devices have attracted great interests in the fields of chemical and biological sensor applications. However, the commercialization of these approaches still remains the challenging issues due to cost effective fabrication routes and reproducibility of sensing performance. To address these issues, our group have developed novel chemical and biological nanowire sensors using top-down and bottom-up fabrication approaches. In this work, we simulated the sensing performance of chemical and biological nanowire devices in order to understand the detailed electrochemical phenomena during highly and selective detections of chemical and biological moiety. For this work, the 3D device simulations coupled with a simplified electrochemical model of electrolyte have been performed using the commercialized software. The simulation results are verified through comparison of our experimental data. Finally, the detailed phenomena are discussed to illuminate the origin of sensing mechanism using nanowire field effect transistor.