

Study on basic sensing principle of chemical and biological nanowire sensor using 3D numerical device simulation

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High-performance semiconductor nanowire ion-sensitive field effect transistor (NW-ISFET) is still challenging for chemical and biological sensors. Despite their potential applications, the basic principles of this technology are not understood due to the complexed physicochemical phenomena, leading to make it difficult to develop the industrial applications. To address these issues, we performed 3D device simulations of NW-ISFET based on ion-screening effect and site binding model of the electrical double layer at insulator/electrolyte interface for the ion-sensing mechanism. From this perspective, we will discuss the effects of various surface morphologies of nanowires to maximize the sensing sensitivity. We believe our approaches will present a new breakthrough in the field of chemical and biological nanowire sensors.