

Basic study on sensing principle in ion-sensitive semiconductor nanowire based chemical sensor

김정수, 임연호[†], 조윤성, 지건구, 김진태
전북대학교
(yeonhoim@jbnu.ac.kr[†])

High-performance semiconductor nanowire ion-sensitive field effect transistor (NW-ISFET) has attracted substantial attention as a next-generation device for chemical and biological sensors in the sensor field. Lack of understanding of sensing mechanism has been regarded as one of the bottlenecks in various applications. Despite their potential applications, the basic principles of this technology entirely yet due to the complexed physicochemical phenomena, leading to making it difficult to develop the industrial applications. As an effort to address this issue, 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. The simulation results were verified through comparisons of our experimental data. In this work, the detailed characteristics will be discussed to illuminate the origin of sensing mechanism using nanowire field effect transistor and to suggest ways to improve sensing performance.