Plasmon Field Effect Transistor for Biosensing and Tailored Photodetection

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Abstract (in 12 Pt Arial Font)

A plasmon field effect transistor (FET) offers direct plasmon-to-electric signal conversion with signal amplification. The unique design of plasmon FET using a thin film transistor structure with gold nanostructures for localized surface plasmon enables a detection of the surface plasmon ersonance induced light absorption and amplification at the same time. The advantage of this hybrid system is that tailored optical deteaction by changing the physical properties of plasmonic nanostructures and its sensitivity from the surrounding refractive index change. We will present the device structure of plasmon FET and the operation details as well as examples of application in bio sensing and tailored optical detection. Plasmon FET based novel sensing platform has several advantages such as extremely small size for the point-of-care system, multiplexing capability, no need of complex optical geometry. In this presentation, sensing mechanisms will be discussed and we will present highly sensitive protein detection in a PBS medium with a wide dynamic range as well as whole blood based biomarker detection. Secondly, we will present the tailored photodetection. By designing gold nanostructure to have specific surface plasmonresonance frequencies, we can control the absorption properties. Combining with customized nanostructure in FET structure, we sucessfully demonstrated a wide range (UV to NIR) spectral response with wide bandgap semiconductor (ZnO). Using the ZnO FET, which has an optical response in UV spectrum, and plasmonic nanostructures, we extended the photodetection range up to IR communication wavelenth.

Biography of Presenter (in 12 Pt Ariel Font)

Dr. Sung Jin Kim is professor of Electrical and Computer Engineering at the University of Louisville. He is also serving as the director of Micro Nano Technology Center (MNTC) at UofL. He received his Ph.D. degree in Electrical Engineering from the State University of New York at Buffalo in 2008. He is a member of IEEE, Etta Kappa Nu and senior member of SPIE (International Society for Optics and Photonics). Dr. Kim's research focuses on Nanophotonics for energy and sensing applications. He uses engineered nanostructures and novel nanomaterials for novel optoelectronic devices.