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An optical fiber based sensing system for label-free real-time biomedical/environmental diagnosis by using surface plasmon polaritons

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Surface plasmon polariton (SPP), the state of a quasi-particle formed from coupling between light and surface plasmon at an interface between a metal and a dielectric has been utilized for biomedical and environmental sensing purpose. A SPP based conventional sensing system of high enough sensitivity uses a bulky spectroscope with a metal coated prism and requires precise tuning of an optical beam path with respect to the prism. The sensing platform presented which is based on a non-spectroscopic technique, operates without such fine tuning of optical path orientation nor a sacrifice of sensitivity for down sizing the sensing platform. We use a polymer-clad multimode optical fiber with its core diameter of a 200 μm as a sensing head where sensing surface is secured by removing the cladding with the subsequent heterogeneous metal coating on tens of nanometer scale. The sensing transducer exploits changes in optical birefringence of the sensor head into which analyte is injected in an aqueous format. We demonstrate, by using glycerol solution, the minimum detectable refractive index change of about 10-6 RIU with the dynamic detection range greater than 0.05 RIU, and without optical modulation or a spectrograph. Potential application of the proposed optical detection platform can include quantitative detection of disease biomarker proteins, pathogenic bacteria, hazardous heavy metals and real-time polymerase chain reaction.

Biography

Heongkyu Ju has completed his PhD at the age of 32 years from Department of Condensed Matter Physics, University of Oxford, UK, and Postdoctoral studies from Department of Electrical Engineering, Technical University of Eindhoven, Netherlands, and Photonic Nanostructure Research Group, NTT Basic Research Laboratories, Japan. He is the Associate Professor at the Department of Nano-Physics, Gachon University, Korea. He has published more than 30 peer-reviewed papers in nonlinear optics, quantum optics, ultrafast semiconductor optics, biophotonics, and organic photovoltaics.

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