Dr. Do Hyun Kang

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Biography:

I am currently a senior researcher at Korea Institute of Machinery and Materials (KIMM) in the department of nano-manufacturing technology. I received my Ph.D. degree at the Seoul National University (SNU) in the mechanical engineering, under the direction of the late Prof. Kahp-Yang Suh and Prof. Noo Li Jeon, in 2014. I was a postdoctoral researcher at University of Michigan, Ann Arbor, in the materials science and engineering, under the supervision of the Prof. Jinsang Kim, from 2015 to 2019. I have joined KIMM since 2019. I have productively studied on diverse topics related to design, fabrication, and device integration of functional materials at the molecular/nano/micro scale for biomedical applications. One of my representative researches are high-sensitive, colorimetric biosensor systems (e.g., microarrays, microbeads, microfluidic chips) based on conjugated polydiacetylene liposomes or metal-free phosphorescent materials. In addition to my biosensor work, I have also enjoyed researches related to design and fabrication of microfluidic devices and microreactors.

Abstract:

In this talk, I will introduce my biosensor researches using two functional materials, conjugated polydiacetylene (PDA) liposomes and metal-free phosphorescence materials.

A conjugated polymer, polydiacetylene (PDA) has an interesting optical property which can change its color from blue to red and emit red fluorescence on exposure to various external stimuli (e.g., heat, chemicals, and biomolecules). Due to this colorimetric response, PDAs have been an attractive material to construct label-free biosensor systems. I have integrated this PDA material to microarray, microbead, or paper-based microfluidic devices, realizing convenient point-of-care kits for detection of platelet function, cancer biomarker, antibody, toxic antibiotics (neomycin), and heavy metal ions.

Phosphorescence materials are another attractive material to develop biosensor systems having high-sensitivity and low signal-to-noise ratio. For the phosphorescence biosensor applications,

I have developed a lipid-polymer hybrid nanoparticles having metal-free organic phosphors with a simple nanoprecipitation-based fabrication method. In addition, I have successfully applied this phosphorescence nanoparticles to the cell-free DNA detection and *in vivo* retinal oxygen monitoring.