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III Wing Lecture Hall,
Ruđer Bošković Institute

Recent Progress on Activatable Photosensitizers and Fluorescent Probes

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Switchable phototheranostic nanomaterials are of particular interest for specific biosensing, high-quality imaging, and targeted therapy in the field of precision nanomedicine. Here, we develop a “one-for-all” nanomaterial that self-assembles from flexible and versatile phthalocyanine building blocks.

The nanostructured phthalocyanine assemblies (NanoPcTBs) display intrinsically unique photothermal and photoacoustic properties. Fluorescence and reactive oxygen species (ROS) generation can be triggered depending on a targeted, protein-induced, partial disassembly mechanism, which creates opportunities for low-background fluorescence imaging and activatable photodynamic therapy (PDT).

We also recently reported a facile strategy to directly assemble a phthalocyanine photosensitizer (PcS) with an anticancer drug mitoxantrone (MA) to form uniform nanostructures (PcS-MA), which not only display nanoscale optical properties but also have the capability of undergoing nucleic acid-responsive disassembly.

In addition, we demonstrated that a new, nanostructured phthalocyanine assembly, NanoPcA, inherently possesses the ability to promote highly efficient ROS generation via the type I mechanism. The results of antibacterial studies showed that NanoPcA has potentially promising PDT applications.

Fluorescence is an important detection method due to its simplicity and high detection limit. Recent progress from our group on the fluorescent probes for HOCl, GSH and phosgene will be also presented.



Juyoung Yoon was born in Busan in 1964. He was graduated with a B.S. from Seoul National University (1987) and received his Ph.D. (1994) from The Ohio State University (Advisor: Dr. Anthony W. Czarnik). After completing postdoctoral research at the University of California, Los Angeles (1994-1996; Advisor: Prof. Donald J. Cram) and at The Scripps Research Institute (1996-1998; Advisor: Prof. Kim D. Janda), he joined the faculty at Silla University in 1998. In 2002, he moved to Ewha Womans University, where he is currently Professor of Department of Chemistry and Nano Science. He is a member of Korean Academy of Science and Technology, Fellow of Royal Society of Chemistry and currently a Distinguished Professor of Ewha.

His scientific awards include “Shim Sang Chul Award” from Organic Division of Korean Chemical Society (2008), “Monthly Best Scientist Award” by Ministry of Science and Technology of Korea, “Knowledge Creation Grand Prize” by Ministry of Science and Technology of Korea (2012), Korean Chemical Society Award (2016) and Ewha Academic Award (2016).

His research interests include investigations of fluorescent probes, molecular recognition, activatable photosensitizers, new organic functional materials and theranostics.

He published 312 SCI research papers (h-index: 87, >29000 citations). He was listed as highly cited research in chemistry of 2014, 2015, 2016 and 2017.

