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Development of Mehanochromic Charge Transfer Complex Materials: Biomedical Imaging Applications both *in Vitro* and *in Vivo*

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New π -conjugated oligomers with high crystallinity were prepared from the simple solvothermal reaction of squaric acid and diaminopyrenes. The oligomers were bonded at the 1,3- and 1,6-positions of the pyrene units, which greatly affected their planer configuration and resulting mechanochromic properties. Oligomers containing a charge transfer (CT) complex were selectively synthesized in one step. Upon mechanical grinding in the solid state, the color changed from orange to deep metallic green. However, this property was lost in solution. To overcome this limitation, we envisioned ordering the CT complexes into a templated design, on a polymer backbone to promote enhanced tumor retention for imaging applications. It is known that the modular structure of CT complexes coupled with environmental dependence on CT properties allows the control over crystal structure and optical properties by alternating CT interactions between electron donors and acceptors. Because small molecule CT complex particles have shown utility in biomedical imaging,²⁹ we were inspired to design CT complexes based on supramolecular self-assembly of natural polymers, which would enable enhanced tumor retention for in vivo imaging applications. Next presentation introduces newly the preparation of CT complex-connecting cellulose. The blue and red emission of CT complexes appended to a cellulose template was induced by using nanoprecipitation, in which a DMSO solution of CT-cellulose was precipitated drop wise into a large amount of water under stirring to form nanoparticles with an aggregation-induced emission effect. Furthermore, due to the biocompatible nature of the CT emission-active material, the cellulose-CT NPs were nontoxic to cells in vitro and could be used for biological imaging.

Biography:

Atsushi Nagai has completed his Ph.D at the age of 28 years from Yamagata University and postdoctoral studies from Kink, Kanagawa, and Kyoto Univeristies. He have been the assistant professor of Kyoto Univeristy unitil 2010. After that, He is now assistant professor and visiting assistant professor at IMS and UTSW, respectively. He has published more than 65 papers in reputed journals.