

電子科学研究所 学術講演会

主催: 北海道大学 電子科学研究所

共催: 高分子学会北海道支部

講演者: **Prof. Guoqing Wang**

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タイトル: **Smart Nanomaterials and Devices**

Actuated by DNA Breathing

会場: 北海道大学 創成科学研究棟 4階セミナー室BC

日時: 令和6年7月30日(火) 16:30~17:30

概要: Smart nanomaterials and devices that respond to external stimuli have important implications in fields ranging from sensing and robotics to therapeutics. Surface ligand modification plays a major role in enhancing the responsiveness and tailoring the physiochemical property of a given material. Various ligands including poly(N-isopropylacrylamide) and azobenzene moieties have been employed as mediators for controlling interparticle forces, which are sensitive to temperature and light, respectively. Toward smart nanomaterials and devices for practical applications, responsiveness to multiple environmental factors yet with adaptability and biocompatibility represents an indispensable step.

In this presentation, an efficient strategy of endowing nanomaterials with adaptable responsiveness and biocompatibility through DNA functionalization and breathing is presented. As a general phenomenon, double-stranded (ds) DNA-functionalized nanoparticles can be colloiddally stabilized even at high ionic strength when the terminal DNA bases are unpaired, due to the entropic repulsion produced by the fraying motion of the outermost free bases. In contrast, the nanoparticles undergo spontaneous assembly upon the pairing of the terminal DNA bases. Based on this finding, DNA breathing driven by chemicals and temperature is investigated; smart nanomaterials and devices responding to chemical, temperature and light have been developed, enabling applications in recyclable chemical sensor, optical switch and environment-dictated antibacterial reagent.



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