2025
PSK-이녹스 신진연구자 웨비나

2025년 11월 14일(금) AM 10:30 - 12:00 | 온라인 상

https://kaist.zoom.us/j/83253990010

주최 한국고분자학회　**주관** 콜로이드 및 분자조립 부문위원회　**후원** INNOX

○ 초대의 글

'PSK-이녹스 신진연구자 웨비나'는 우수한 연구역량을 가진 신진연구자를 발굴하여 교류의 장을 넓히고자 (주)이녹스의 후원과 한국고분자학회 주최로 마련한 온라인 세미나입니다. 이번 세미나에서는 고분자 분야 중에서도 특히 콜로이드 및 자기조립소재를 이용하여 선도연구를 수행하는 신진연구자의 우수한 연구성과를 공유하는 자리를 마련하였으니 관심있는 분들의 많은 참여 부탁드립니다.

○ 일정

AM 10:30 - 11:15

Chemically Programmable Assembly of Plasmonic Nanocrystal Gels via Metal–Ligand Equilibria

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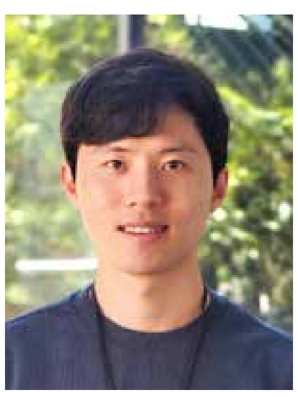

ABSTRACT: Colloidal nanocrystal gels, low-density percolating networks with interconnected nanoscale colloids, provide a versatile platform for translating the distinct properties of nanocrystals into macroscopic functional materials. Beyond what is achievable through synthetic tuning of individual particles, these gels exhibit structure-dependent collective behaviors governed by particles' spatial organization, such as plasmon coupling among assembled particles. By incorporating stimuli-responsive components, nanocrystal gels further enable dynamic reconfiguration between structurally distinct states, opening pathways to switchable optical materials. However, challenges remain due to limited control over colloidal phase behavior and gel structure, as well as the lack of experimental tools capable of probing microscopic features such as link formation. To address these challenges, this talk introduces a simple, broadly tunable gelation strategy based on competitive metal-ligand equilibria. Gelation of plasmonic tin-doped indium oxide (ITO) nanocrystals is driven by transition metal ions coordinating with terpyridine-functionalized ligands anchored to the nanocrystal surface, while reversible disassembly is induced by heating in the presence of halide ions acting as competitive ligands. Link formation is quantified in situ using distinct optical signatures of cobalt(II) complexes and further characterized by molecular simulations, providing microscopic insights into gelation mechanisms. Generalizing the strategy across diverse metal and halide ions enables modular control over colloidal phase behavior and gel structure through simple chemical inputs, thereby allowing rational design of nanocrystal gels with tailored collective optical responses. The infrared absorption spectra of ITO nanocrystals exhibit an abrupt shift at a chemically tunable gelation temperature, reflecting strong plasmonic coupling. By varying nanocrystal size, doping, and ligand length, the gel plasmonic response is further refined to develop a "plasmon ruler" that correlates spectral shifts with gel structure, enabling the design of gels with unusual spectral narrowing. Finally, extending this chemistry to multicomponent systems allows the assembly of randomly mixed nanocrystal gels with mixing-ratio-tunable optical responses.

AM 11:15 - 12:00

Precision Engineered A-*b*-(B-*r*-C) Block Copolymers for High-resolution Directed Self-assembly

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ABSTRACT: Directed self-assembly (DSA) of block copolymers (BCPs) continues to emerge as a robust and complementary patterning approach for extreme ultraviolet (EUV) lithography. However, the performance of conventional systems remains constrained by limited segregation strength and interfacial control. In this work, we explore an A-*b*-(B-*r*-C) block copolymer architecture designed to provide tunable interfacial properties and phase behavior through controlled random segment composition. This design concept enables flexible adjustment of surface affinity and self-assembly characteristics, offering pathways toward well-ordered nanoscale morphologies compatible with advanced lithography requirements. Through a combination of precision synthesis and multimodal characterization, we investigate how compositional variations influence molecular self-assembly behavior. The resulting insights establish a framework for linking polymer chemistry to pattern formation and process stability. Overall, this study highlights the potential of compositionally engineered block copolymers as a versatile materials platform for next-generation DSA applications in semiconductor manufacturing.

한국고분자학회
The Polymer Society of Korea