2026 PSK-이녹스 신진연구자 웨비나

2026년 9월 18일(금) AM 10:00 - 11:40 | 온라인 상

https://snu-ac-kr.zoom.us/j/3449875583

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 10:00 - 10:50

Interfacial Adhesion of Polyelectrolyte Brushes Induced by Oppositely Charged Macromolecular Counterions

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Abstract: Polyelectrolyte brushes are widely used as model systems for studying electrostatic interactions at soft interfaces and for achieving outstanding lubrication performance. Previous studies have largely examined their behavior with multivalent counterions, which cause brush collapse, ionic crosslinking, and marked changes in interfacial structure. However, interactions between polyelectrolyte brushes and oppositely charged macromolecular counterions, such as polycations, remain poorly understood. In this study, we prepared well defined polystyrene sulfonate (PSS) brushes through surface initiated grafting and used Surface Forces Apparatus (SFA) measurements to investigate their interactions with oppositely charged polycations. Unlike multivalent ions, these polycations did not cause noticeable brush collapse, but instead produced substantial adhesion between symmetric PSS brush layers. This adhesion increases with both contact time and applied load, eventually reaching a steady plateau, indicating that the interaction is governed not simply by electrostatic screening but by the gradual formation of polycation-mediated bridging under confinement. In addition, adding monovalent Na+ ions disrupted this adhesive behavior even at very low concentrations, indicating that the bridging of the adsorbed polycation is highly sensitive to competing ionic screening. By contrast, measurements using trivalent counterions showed the expected brush collapse but little dependence of adhesion on contact time, pointing to a clear mechanistic difference from the polymeric counterion system. Together, these findings show that molecular size, configurational constraints, and rearrangement under confinement, rather than charge valency alone, control how macromolecular counterions interact at brush interfaces. This work provides new insight into the molecular origins of adhesion and the regulation of interfacial interactions in charged polymer brush systems.

Reference
[1] Jinwoo Park, Daniel Rosenmann, Wei Chen, Matthew Tirrell, "Interfacial Adhesion Mechanism of Anionic Polyelectrolyte Brushes Induced by Oppositely Charged Macromolecular Counterions", Macromolecules, accepted

AM 10:50 - 11:40

**Structural Color from Cyclic Diblock Copolymers:
Topology-Driven Ordering and Tuning by Cyclic Homopolymer Additives**

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ABSTRACT: Structural color in high-molecular-weight (HMW) block copolymers has been challenging to control: pronounced chain entanglement slows ordering and narrows the range of architectures that can be synthesized and driven into well-formed photonic crystals. Here we show that cyclic topology alone supplies both the ordering and the tunability. Exploiting the compounded sequence and spatiotemporal topology control of Lewis pair polymerization, one-pot copolymerization of (meth)acrylic monomer mixtures delivers well-defined cyclic diblock copolymers (CDCs) of high molecular weight at 20 g scale. The resulting CDC spontaneously self-assembles into a well-ordered lamellar structure that reflects a vivid blue. In situ small-angle X-ray scattering shows that this assembly proceeds far faster than in the linear counterpart, yielding long-range order and improved lamellar domain purity while bypassing kinetically trapped morphologies. Blending the CDC with its linear analogue suppresses the color, tracking the loss of lamellar order. Because the ordering originates in the cyclic topology itself, blending instead with cyclic homopolymer additives swells the lamellae to 123% of their initial spacing and tunes the reflected wavelength from 467 to 608 nm, spanning blue to orange. Chain topology thus emerges as a synthetically accessible handle for structural color in entangled HMW systems, one that operates independently of molecular weight.

Reference
[1] Jiyun Nam, Eugene Y.-X. Chen, "Structural Colors of Cyclic Diblock Copolymers Enabled by Topology-Driven Structural Ordering and Tuned by Blending with Constituent Cyclic Polymers", JACS, 148 (12), 12870–12879 (2026)