

2026

PSK-이녹스 신진연구자 웨비나

2026년 5월 29일(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

○ 초대어 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

Microstructural Design of Organic Mixed Ionic-Electronic Conductors to Program Organic Electrochemical Transistor Behavior

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ABSTRACT: Organic electrochemical transistors (OECTs) exhibit ionic-electronic coupling that closely mimics biological signal transmission, where ions mediate communication between pre- and post-synaptic neurons. This unique operation enables high transconductance at gate voltages below 1 V, making OECTs a promising platform for a wide range of bioelectronic applications, including human-machine interfaces, biosensors, and neuromorphic devices. Because OECTs operate through electrolyte gating, their performance is governed by the coupled transport of ions and electronic charge carriers, rendering them highly sensitive to both the chemical structure and microstructure of the channel material.

In this talk, I demonstrate how microstructural design of OMIECs governs OECT behavior across a broad structural spectrum, from highly ordered to fully disordered morphologies. A material-agnostic colloidal self-assembly strategy is employed to fabricate uniformly porous OMIEC films, enabling systematic investigation of the role of porosity in governing ion-electron transport and OECT performance. In contrast, disordered microstructures are introduced via phase separation to stochastically control the percolation of conjugated polymer domains between electrodes, giving rise to device-to-device variability and emergent electrical behavior. Such stochastic characteristics further provide a foundation for bioelectronic security systems.

AM 10:50 - 11:40

Origin of Pattern Rectification in EUV + DSA: Role of Interfacial Width

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ABSTRACT: Directed self-assembly (DSA) of block copolymers (BCPs) has shown great success in rectifying poorly defined patterns in extreme ultraviolet (EUV) lithography, particularly those arising from stochastic challenges. In this "EUV + DSA" strategy, EUV resist patterns are first converted into chemical pre-patterns. BCPs are then assembled on these templates, forming well-defined nanodomains that follow the underlying chemical templates. By selectively removing one block, the DSA patterns are transformed into topographic etch masks for pattern transfer into device-relevant inorganic materials. By leveraging thermodynamically driven BCP nanostructures, EUV + DSA effectively rectifies stochastic defects and edge roughness in EUV patterns. This "pattern rectification" strategy effectively relaxes the stringent requirements for EUV resists to simultaneously meet high resolution, low roughness, and high sensitivity, which in turn reduces overall energy costs. Manufacturing-scale studies by IMEC and Intel have demonstrated that this process can achieve line width roughness (LWR) below 2 nm with the low-quality resists at 50% reduced EUV doses, meeting critical industry requirements.

Here, we address fundamental questions regarding material design, BCP physics, and process development for EUV + DSA. First, using PS-b-PMMA, the standard DSA material, we investigate the origin of pattern rectification and the impact of BCP interfacial width. We show that while the intrinsic interfacial width sets the fundamental limit for domain boundary fluctuations in DSA, significant smoothing occurs during the selective removal process, indicating that pattern rectification is governed not only by thermodynamic properties (interfacial width), but also by process-induced smoothing during selective removal. Building on these insights, we design and synthesize a new DSA material based on an A-block-(B-random-C) architecture, achieving both a high Flory-Huggins interaction parameter (χ) and equal surface energy ($\Delta\gamma=0$) for high resolution and perpendicular orientation. This system achieves an interfacial width as low as 2 nm, substantially lower than that of PS-b-PMMA (~5 nm), leading to reduced domain fluctuations and improved pattern quality.

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The Polymer Society of Korea