

2024

## PSK-이녹스 신진연구자 웨비나

2024년 8월 19일(월) PM 1:00 - 3:00 | 온라인 상

<https://us02web.zoom.us/j/9301732845>

주최 한국고분자학회



주관 에코소재 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. 고분자 분야 중에서도 특히 에코소재를 이용하여 선도연구를 수행하는 신진연구자의 우수한 연구성과를 공유하는 자리를 마련하였으니 관심있는 분들의 많은 참여 부탁드립니다.

## ○ 일정

PM 1:00 - 2:00	Impacts of Polymer Structures on Ion Transport and Membrane Performance Min Gyu Shin (신민규), mingyush@umich.edu Department of Chemical Engineering, University of Michigan, Ann Arbor
	<p>ABSTRACT: Polymeric membranes enable selective ion transports driven by pressure or electrical forces, making them important for advanced environmental technologies. Despite their importance, research has largely focused on enhancing performance through new chemistries, coating/modification, and process optimization. However, the fundamental study of ion transport behavior and membrane performance remains limited, even though it is vital for improving the technologies.</p> <p>This challenge arises from the need for specific membrane properties tailored to various applications and their complex structures. For instance, reverse osmosis (RO) membranes used in seawater desalination have heterogeneous and ultra-thin structures (<math>&lt;1\ \mu\text{m}</math>), complicating the control of their structures and the study of ion transport mechanisms. Similarly, ion-exchange membranes (IEMs) used in electrochemical processes face challenges due to the lack of theoretical frameworks and suitable characterization tools for assessing structure-property-performance relations.</p> <p>In this presentation, I will discuss how systematically controlled polymer structures, combined with advanced characterization techniques, can provide new insights into the ion transport in RO membranes and IEMs. Additionally, I will explore how these structural changes impact membrane performance and propose novel approaches to enhance the potential of polymeric materials in advanced environmental technologies.</p>
PM 2:00 - 3:00	Polymerization/Depolymerization-Induced Phase-Transition under Combined Equilibria of Polymerization with Self-Assembly Jiyun Nam (남지윤), nom0830@colostate.edu Department of Chemistry, Colorado State University
	<p>ABSTRACT: Depolymerization breaks down polymer chains into monomers like unthreading beads and is gaining more attention for its sustainability potential. When polymerization approaches equilibrium, polymerization and depolymerization can occur reversibly by lowering and elevating the temperature. Here, we demonstrate how dynamic polymerization equilibrium control of a growing polymer chain in a selective solvent can spontaneously influence the self-assembly of block copolymer micellar nano-objects. Compared to polymerization-induced self-assembly (PISA), where the irreversibly extended solvophobic polymer block from a solvophilic polymeric end generates micellization, polymerization/depolymerization-induced self-assembly (PDISA) presented in this study enables us to induce more drastic morphological transition by chopping the polymeric chain into monomer in depolymerization dominant states. By switching polymerization and depolymerization dominance with temperature swing, reversibly regulated packing parameters of the forming block copolymer induce reversible morphological transitions of the nanoobjects. Under the combined equilibria of polymerization with self-assembly, we found that spontaneous micelle formation during the polymerization occurs, and produces a noticeable entropic penalty toward polymerization. In a more selective solvent, the segregation of the solvophobic block from the reaction medium of the growing polymer entropically facilitates depolymerization at a substantially lower temperature. We show that reversible rod-sphere-rod and fiber-rod-fiber morphological transition is induced by PDISA along with viscosity swing, suggesting their potential as dynamic soft materials.</p>

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