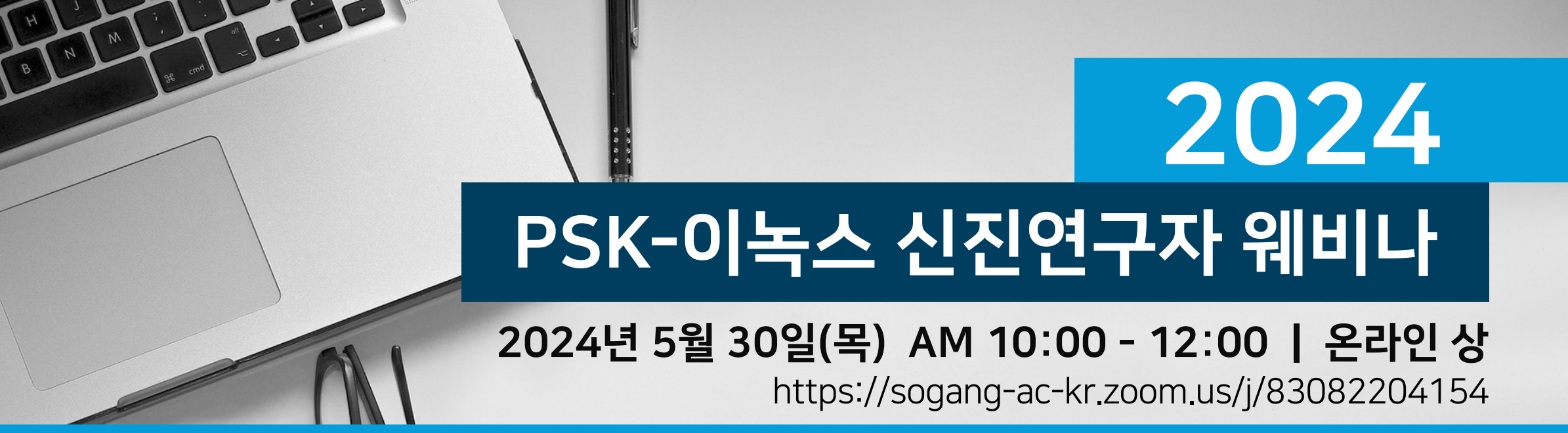

2024 PSK-이녹스 신진연구자 웨비나

2024년 5월 30일(목) AM 10:00 - 12:00 | 온라인 상

https://sogang-ac-kr.zoom.us/j/83082204154

주최 한국고분자학회 주관 분자전자 부문위원회 후원 INNOX

○ 초대의 글

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

○ 일정

AM 10:00 - 10:40	Tunable Liquid-State Lasers Based on Type-(I+II) Colloidal Quantum Dots Donghyo Hahm (함동효), donghyohahm@lanl.gov Los Alamos National Laboratory

ABSTRACT : Colloidal quantum dots (QDs) hold potential for lasing applications due to their tunable emission wavelengths, high quantum yields, and low optical gain thresholds. However, nonradiative Auger recombination hinders QD lasing by causing rapid optical gain relaxation. This issue is especially problematic in dilute gain media like liquid-state QD solutions, where achieving stimulated emission faster than Auger decay is difficult due to low QD concentrations. To address this challenge, we introduce type-(I+II) QDs featuring a trion-like optical-gain state, leading to strongly suppressed Auger recombination and extended optical gain lifetimes. This reduces the critical QD concentration, facilitating lasing in diluted QD solutions. Integrated into a Littrow optical cavity, these QDs exhibit narrow line lasing tunable from 634 nm to 590 nm. With wider-bandgap QDs, we achieve lasing at shorter wavelengths around yellow-green (~575 nm). These findings demonstrate the potential of type-(I+II) QDs as an alternative to traditional laser dyes, offering stable operation without requiring gain medium circulation. This simplifies system design compared to dye lasers and reduces device size. Additionally, QDs offer flexibility in chemical properties and optical characteristics, instigating renewed interest in liquid-state lasers for diverse applications in optofluidics, diagnostics, sensing, imaging, and more.

AM 10:40 - 11:20	Design of Phenoxazine-based Cathodes for Organic Batteries Kyunam Lee (이규남), lgn0427@gmail.com Department of Chemistry, Columbia University

ABSTRACT : High-voltage p-type redox-active organic materials (ROMs) are emerging as sustainable alternatives to conventional transition metal oxide cathodes in lithium-ion batteries. This talk will outline design strategies for the development of high performance organic cathodes from the molecular to the electrode level. First, we will introduce phenoxazine as a novel organic redox-active building block and demonstrate its capability for rapid charging and discharging. Second, we will explore in situ electrochemical crosslinking strategy to overcome the trade-off between stability and charge transfer kinetics. Finally, the talk will focus on enhancing cathode performance by exploiting the interactions between polymer binders and phenoxazine. This series of studies will provide insights for advancing towards practical organic batteries.

AM 11:20 - 12:00	Bio-Inspired Nervous System Based on Artificial Synapse Seongchan Kim (김성찬), skim20211@gmail.com The Pennsylvania State University

ABSTRACT : Neuroprosthetics aim to perceive and respond to stimuli through signal exchange with living organisms, replacing damaged nerves and organs by mimicking the complex nervous system of humans. The use of artificial synapses to emulate the biological nervous system is a key factor enabling the fabrication of portable Neuroprosthetics that can perform the function of the complex nervous system. This study focuses on the development of artificial synapses and artificial nervous systems for Neuroprosthetics.
In this research, a P(VDF-TrFE)-based ion-mitigating layer was employed to fabricate artificial synapses. Consequently, effective control of ion migration properties within the ion gel system was achieved. Furthermore, through the introduction of metal-organic frameworks (MOFs) as the ion-mitigating layer, we fabricated the artificial synapses with short-term or long-term enhanced synaptic plasticity by modulating the ion migration properties.
Additionally, based on our artificial synaptic devices, we successfully demonstrated artificial nervous systems. We emulated stimulus-response systems such as the reflexes in our ocular system and conscious response. Focusing on sensing the stimuli or response, these systems were also enhanced in terms of perception and response. The development of artificial nervous systems is significant in that it paves the way for the restoration of human cognition and response, presenting a promising direction for the future development of Neuroprosthetics.

한국고분자학회
The Polymer Society of Korea