

Polymers with Dynamic Bonds: Light-Programmable Processing and Sustainable Functional Materials



• Time: 2026.03.10. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Chae Bin Kim

Dept. of Polymer Science and Engineering, Pusan National University

Abstract

Dynamic bond chemistry offers a powerful molecular design strategy to reconcile performance, processability, and sustainability in crosslinked polymer systems. In this presentation, I will introduce two complementary approaches that exploit dynamic and/or reversible chemical transformations to enable light-programmable processing and environmentally benign functional materials.

First, we demonstrate spatiotemporal control over network rearrangement in thermosets through photo-activated dynamic bond exchange. By incorporating a photo-latent transesterification catalyst, a conventional thermoset can be converted into a covalent adaptable network (CAN)—a permanently crosslinked polymer network capable of topology rearrangement via dynamic covalent bond exchange—only upon light exposure. This enables on-demand repair and reprocessing while maintaining thermoset-like stability during service. In parallel, disulfide-based CANs exhibit UV-accelerated bond exchange at room temperature, allowing contactless welding, shape reconfiguration, and microstructural fixation without bulk heating or external pressure. These light-fueled processes decouple processing from service conditions and significantly reduce energy input.

Second, dynamic chemistry is extended to sustainable coating technologies via a polarity-switchable maleic anhydride-containing copolymer. Base-induced ring opening enables water-based, VOC-free coating formulations, while subsequent thermal treatment restores hydrophobic durability. This reversible polarity modulation eliminates organic solvents without compromising performance.

Together, these strategies illustrate how dynamic covalent bonds can serve as a unifying platform for programmable manufacturing, solvent-free processing, and circular material lifecycles, advancing the development of sustainable functional polymers.

Approaches to Generating Novel Intellectual Property Based on Patent Analytics



• Time: 2026.03.17. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Jaewon Moon

Director of Technology, Hana IP Law Firm

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Electrochemical synthesis of long-chain hydrocarbons and oxygenates using carbon dioxide and acetylene



• Time: 2026.03.24. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Boon Siang Yeo

Department of Chemistry, National University of Singapore

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Engineering Electrochemical Oxidation Pathways: From Catalysts to Reactors



• Time: 2026.03.31. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Jun Hyuk Moon

Department of , Korea University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Structural Coloration with Curved Interfaces



• Time: 2026.04.07. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Shin-Hyun Kim
Department of , KAIST

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Curveballs in Battery Multiscale Dynamics: From Fluctuating Diffusion to Electrode Crosstalk



• Time: 2026.04.14. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Jongwoo Lim

Department of , Seoul National University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Single-Atom Catalysts and High-Entropy Nanomaterials for Water Splitting



• Time: 2026.04.28. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Ho Won Jang

Department of , Seoul National University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Catalytic Conversion of Mixed Plastics and Packaging Films



• Time: 2026.05.14. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Dionisios G. Vlachos

Department of , University of Delaware

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Harnessing Solar and Thermal Energy for Carbon-Neutral Power and Fuels



• Time: 2026.05.19. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Sung-Yeon Jang

School of Energy and Chemical Engineering, UNIST

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific–Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Sustainable Iontronics: Host-Guest Engineering of Ionic Matter



• Time: 2026.05.26. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Do Hwan Kim

Department of , Hanyang University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific-Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Synthetic Biology for Next-Generation Microbial Biotechnology



• Time: 2026.06.02. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Min-Kyu Oh

Department of , Korea University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific-Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.

Metal-Organic Frameworks (MOFs): The Era of Molecular Architecture



• Time: 2026.06.09. (Tue) 16:00-17:15

• Place: 104-E206 Classroom

Speaker

Prof. Kyungmin Choi

Department of , Sookmyung Women's University

Abstract

Global warming has intensified the frequency, duration, and severity of heatwaves worldwide, with the Korean Peninsula experiencing disproportionately rapid temperature increases compared to the global average. This study examines the causes, mechanisms, and impacts of heatwaves in Korea, drawing on historical observations, climate model projections, and case analyses. Results indicate that rising global mean surface temperature, coupled with regional atmospheric dynamics such as the expansion of the North Pacific High and Tibetan High, has significantly advanced the onset and persistence of extreme heat events. The unprecedented heatwaves of 1994, 2018, and 2025 illustrate how large-scale circulation patterns—including the Circumglobal Teleconnection (CGT), Pacific-Japan (PJ), and Arctic Oscillation (AO)—amplify heat extremes. Climate projections further suggest that heatwave days and tropical nights will continue to increase, particularly affecting vulnerable groups such as the elderly, outdoor workers, and low-income communities. The socioeconomic consequences are substantial, including increased mortality, public health risks, energy demand surges, and agricultural losses. These findings highlight the urgent need for region-specific adaptation strategies, early-warning systems, and policy measures to mitigate the unequal burdens of heatwave risks in a warming climate.