7th Symposium of Grubbs Center for Polymers and Catalysis

Organized by 홍석원, 윤명한, 이은지 (GIST)

Sponsored by 그럽스 노벨 연구센터

Program

일 시: 2020년 12월 17일(목) 15:00 ~ 17:30
온라인(zoom meeting) 주소:
https://us02web.zoom.us/j/81348740355?pwd=eHVSY2FOOXg0Q0ZBMEIrSDdZdDVDdz09

시간	발표내용	발표자
	1부 Opening	(좌장: **이은지** 교수)
15:00 ~ 15:10	인사말	홍석원 교수 (GIST)
15:10 ~ 15:40	Surface Functionalization with Chemical and Physical Cues for Bio- & Environmental Applications	양성윤 교수 (충남대학교)
15:40 ~ 16:10	Structural Colors of Mie-Resonant Hollow Carbon-Silica Nanospheres	이기라 교수 (성균관대학교)
16:10 ~ 16:20	Coffee break	
	2부 Opening	(좌장: **윤명한** 교수)
16:20 ~ 16:50	Multifunctional Nanocomposites from Naturally Derived Materials: Conductive Melanin and Crystalline Nanocellulose	심봉섭 교수 (인하대학교)
16:50 ~ 17:20	Intrinsically disordered protein sequence tunes membrane-less organelles as selective chemical reactors inside cells	황동수 교수 (포스텍)
17:20 ~ 17:30	Closing	

Surface Functionalization with Chemical and Physical Cues for Bio- & Environmental Applications

Sung Yun Yang

Department of Organic Materials Engineering, Chungnam National University
99 Daehak-Ro, Yuseong-Gu, Daejeon 34134, Republic of Korea

E-mail: sungyun@cnu.ac.kr

Sensing chemical and biological molecules by using microfluidic devices received a great deal of attention recently. However, it is still challenging to control of the surface properties of these devices on demand. In this talk, I will briefly review the work conducted in my lab for a decade on the functional coatings to modify various substrates including micro-channeled devices for biomedical applications, for example, protein/cell based chips and drug-delivery systems. We have used various polymers including biodegradable polymers and inorganic nanoparticles for fabricating functional thin film coatings by using a layer-by-layer deposition process. Among the coatings, polyelectrolyte multilayer films having neutral or negatively charged hydrophilic property tend to exhibit excellent cell-blocking ability with non-cytotoxic nature. We applied these excellent biocompatible coatings with micro-contact printing, and studied cellular activities including adhesion, motility, proliferation, cell-cell networking (in the case of neuronal cells) both on open flat surface and on inner surfaces of micro-channeled devices. In addition, we synthesized amphiphilic copolymers and supramolecular oligomers for multi-component films to enhance selective sensing ability of the coating for biochip application.

Structural Colors of Mie-Resonant Hollow Carbon–Silica Nanospheres

Gira Lee

Department of Chemical Engineering, Sungkyunkwan University Suwon 16419, Republic of Korea

E-mail: yigira@skku.edu

Hollow carbon–silica nanospheres that exhibit angle-independent structural color with high saturation and minimal absorption are made. Through scattering calculations, it is shown that the structural color arises from Mie resonances that are tuned precisely by varying the thickness of the shells. Since the color does not depend on the spatial arrangement of the particles, the coloration is angle independent and vibrant in powders and liquid suspensions. These properties make hollow carbon–silica nanospheres ideal for applications, and their potential in making flexible, angle-independent films and 3D printed films is explored.

Multifunctional Nanocomposites from Naturally Derived Materials: Conductive Melanin and Crystalline Nanocellulose

Bong Sup Shim

Department of Chemical Engineering, Inha University, 100 Inharo, Incheon, 22212 Republic of Korea

E-mail: bshim@inha.ac.kr

Natural systems utilize multifunctional biocomposites by a bottom-up assembly of nanomaterials for creating hierarchical multiphasic structures, while conventional human-made composites increase one functionality by sacrificing the others. Here, we introduce molecularly assembled multifunctional nanocomposites from natural biomaterials, including high crystalline cellulose nanofibers and conductive melanin nanoparticles. Tunic cellulose nanofibers have shown high crystallinity, straight fibrous shape, and liquid crystalline alignments. Thus, their nanocomposites showed excellent optical, mechanical, and surface properties. On the other hand, naturally derived melanin nanoparticles are molecularly structured to possess finely tunable electrochemical conductivities, optical reflectivity, and casting shape stability with inherent biocompatibility. These composites can be used as essential functional materials in emerging bioelectronics applications such as biotic-abiotic interfaces, implantable bionics, and eco-green electronics.

Intrinsically disordered protein sequence tunes membrane-less organelles as selective chemical reactors inside cells

Dong Soo Hwang

Division of Environmental Science and Engineering (DESE), Pohang University of Science and Technology (POSTECH), Pohang, 37673, Republic of Korea

E-mail: dshwang@postech.ac.kr

Around 50% of the protein sequence with segment length >30 amino acids coded by the human genome are predicted to be intrinsically disordered proteins (IDPs) without a three-dimensional structure. Recent research has provided clues that IDPs play a key role in protein regulation inside cells, as well as participate in the formation of membraneless organelles. Interestingly, some membraneless organelles composed of IDPs have displayed liquid-like physical properties, suggesting that intracellular droplet formation by liquid−liquid phase separation (LLPS) may be a relevant mechanism for the formation of membraneless organelles. There are examples in the literature of membraneless organelles found in living cells. In this presentation, variations in water diffusion, viscosity and interfacial tension depending on the primary sequence of IDP will be presented, and the roles of the protein primary sequence in the membrane-less organelles for a selective chemical reactors inside cell will be discussed.