세미나 초록

성명	오승수
소속	POSTECH 신소재공학과
발표 주제	Protein mimicking: molecular recognition-mediated complex functions of nucleic acids for biomedical applications
발표 내용	In nature, there are a number of different proteins to play critical roles in sustaining cellular lives. Based on long chains of 20 different amino acid molecules, the exceptionally complicated biomolecules typically possess unique folding structures, which can perform their own molecular functions essential for living organisms. Among the abilities of proteins, molecular recognition would be one of the most important and fundamental ones; many proteins specifically bind to other molecules by providing the binding pockets with molecular complementary to the target molecules. For example, cells communicate with each other through a variety of cellular signaling pathways as cell membrane receptors specifically recognize desired signaling molecules, such as extracellular proteins, hormones, neurotransmitters, and even ions. For the adaptive immune system, biological antibodies identify and neutralize foreign substances by selectively binding to different antigens, which serves as an effective way of protection against infectious pathogens and viruses. Moreover, enzymes, as biocatalysts, need the specific substrate binding ability to catalyze many different biochemical reactions that are chemo- and regioselective and even stereospecific unlike the reactions of chemical catalysts. My work has focused on the development of novel methodologies to generate nucleic acid-based proteomimetic biopolymers and their applications. In this talk, I will introduce two different classes of highly functionalized nucleic acids: ones that mimic membrane receptors and enzymes. As an exemplar, mimicking ACE2, which is known to mediate the entry of SARS-CoV-2 into human cells for viral infection, will be demonstrated by our newly developed in vitro selection strategy. In mimicking enzymes, I will introduce the discovery of catalytic nucleic acids that enable amide bond formation for ultra-site-specific conjugations. Using this ultra-efficient and site-specific conjugation techniques, I will demonstrate interesting biomedical applications, including semi-permanently activated enzymes, chemically defined antibody-drug conjugates, and selectively degraded proteins.