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강연제목: 적응 광학을 이용한 isoSTED 현미경의 3 차원 초고분해능 이미징

isoSTED nanoscopy for three-dimensional super-resolution imaging using adaptive optics

Abstract: Observing cellular structure and dynamics at the molecular scale is desirable to solve cell biological questions. Although optical microscopy enables us to noninvasively visualize cellular structures in three dimensions, the limit of resolution is imposed by optical diffraction. To overcome this challenge, Stimulated Emission Depletion (STED) nanoscopy improves the resolution by quenching the fluorescent signals in the periphery of the excitation focus so that the size of the effective fluorescent focal spot is directly reduced. However, the diffraction-limited focus is elongated in the axial direction at least 2.5 times. Here, 4Pi geometry was applied to STED microscopy, referred to as isoSTED nanoscopy to generate a hollow sphere-shaped focal spot. Also, adaptive optics is used to compensate for optical aberrations and achieve resolution enhancement, resulting in sub-50-nm isotropic resolution in whole cell and thick tissue samples.

Brief Biosketch

Dr. Dong-Ryoung Lee is currently an assistant professor of Mechanical Engineering at Soongsil University in Seoul, Korea. She received her B.S., M.S., and Ph.D degrees in Mechanical Engineering from KAIST in 2011, 2013, and 2017, respectively. She moved to the National Institute of Standards and Technology, Maryland, USA in 2017 and worked as a Guest Researcher in the Engineering Physics Division. Since 2018, for 4 years in the department of Cell Biology at Yale University, Connecticut, USA, she has worked on the development of STED microscopy as a postdoc and an associate research scientist training with Dr. Joerg Bewersdorf. Her research interests cover developing novel optical systems based on STED microscopy as well as STED lithography.