NS-003 <Invited Talk>

Phage Litmus: Biomimetic Virus-Based Colorimetric Sensors for Explosive Detection

오진우

부산대학교 나노소재공학과

Nature utilizes various of the colorization process. Some species of birds can express their mood of tempers by changing their collagen structures on skin. For example, turkey can change their skin color by expansion of the collagen structures, which are associated with the distinct color changes. Here, we developed bioinspired virus-based colorimetric sensors which can be genetically tuned for target molecule. Using M 13 bacteriophage, we fabricated responsive self-assembled color matrices composed of quasi-ordered fiber bundle structures. These virus matrices can exhibit color change by stimuli through fiber bundle structure modulation. Upon exposure of volatile organic compounds, the resulting multi-colored matrices exhibited distinct color changes with different ratios that can be recognized by the naked eyes. Using the directed evolutionary approaches, we genetically engineered the virus matrix to incorporate binding motif for explosive detection (i.e., trinitrotoluene (TNT)). Through utilizing a common handheld device (i.e., iPhone), we could distinguish TNT molecules down to 20 ppb in a selective manner. Our novel biomimetic virus colorimetric sensor can overcome current limitation for low response selectivity.

Keywords: M-13 bacteriphage, Color sensor, Self-assembly, Structural color, TNT

NS-004 <Invited Talk>

Vertically-Aligned Nanowire Arrays for Cellular Interfaces

김성민, 이세영, 강동희, 윤명한

광주과학기술원 신소재공학부

Vertically-aligned silicon nanostructure arrays (SNAs) have been drawing much attention due to their useful electrical properties, large surface area, and quantum confinement effect. SNAs are typically fabricated by chemical vapor deposition, reactive ion etching, or wet chemical etching. Recently, metal-assisted chemical etching process, which is relatively simple and cost-effective, in combination with nanosphere lithography was recently demonstrated for vertical SNA fabrication with controlled SNA diameters, lengths, and densities. However, this method exhibits limitations in terms of large-area preparation of unperiodic nanostructures and SNA geometry tuning independent of inter-structure separation. In this work, we introduced the layer-by-layer deposition of polyelectrolytes for holding uniformly dispersed polystyrene beads as mask and demonstrated the fabrication of well-dispersed vertical SNAs with controlled geometric parameters on large substrates. Additionally, we present a new means of building in vitro neuronal networks using vertical nanowire arrays. Primary culture of rat hippocampal neurons were deposited on the bare and conducting polymer-coated SNAs and maintained for several weeks while their viability remains for several weeks. Combined with the recently-developed transfection method via nanowire internalization, the patterned vertical nanostructures will contribute to understanding how synaptic connectivity and site-specific perturbation will affect global neuronal network function in an extant in vitro neuronal circuit.

Keywords: vertical nanowire neurons