생체모방 자기 유도 조립기법을 이용한 다차원 미세 패터닝 (Multi-dimensional Micropatterning through Biomimetic Self-Templating Assembly)

허 광[1,2,†], Seung-Wuk Lee[2]

[1]세종대학교 나노신소재공학과; [2]Department of Bioengineering, University of California, Berkeley

(kheo@sejong.ac.kr[†])

Nature has a remarkable ability to create diverse functional structures through self-assembly process. The resulting structures exhibit hierarchical organization with exquisite material properties. Although recent advance of direct self-assembly enables to organize small molecules, particles, and microelectronic devices into sophisticated functional structures and devices, the functional and structural complexity of manmade materials does not compare to that of natural systems such as butterfly wings, diatoms, mantis shrimp. Here, we have developed a novel biomimetic directed-self-assembly process which closely mimics the natural self-assembly processes. By using M13 bacteriophage, intermolecular interactions at the meniscus of a dip casted substrate were exploited to guide the self-assembly of phages into three-dimensionally functional nanostructures. These micro-structures exhibited exquisite optical properties, such as structural color and optical switching behaviors. Our multi-dimensional assembly process can be expanded to the directed self-assembly of many other colloidal particles for constructing three dimensionally ordered structures.