Self-assembly based Nanostructures for Stretchable Devices

손정곤†
한국과학기술연구원
(jgson@kist.re.kr†)

Stretchable electronics, which require the stretchability necessary to endure complex motions from humans, have recently attracted considerable attention for bio-implantable and wearable devices. In this talk, we suggest several self-assembly based approaches for structure-assisted stretchable energy storage electrodes. We introduce novel 2D reentrant cellular structures of porous graphene/CNT networks for omnidirectionally stretchable supercapacitor. The 2D reentrant structures of graphene/CNT networks maintained excellent electrical conductivities under biaxial stretching conditions and showed a near-zero Poisson's ratio over a wide strain range because of their structural uniqueness. We also demonstrated an all-stretchable lithium-ion battery based on re-entrant micro-honeycomb graphene-CNT/active materials stretchable electrodes, a gel polymer electrolyte as a stretchable separator, and butyl rubber encapsulation. The stretchable battery showed high energy storage capacity, exceeding 5 $mAh{\cdot}cm^{-2}$ of the areal capacity, and operated stably over 100 charging/discharging cycles under various strains up to 50%, and over 500 cycles under 50% repetitive strain/release.