Suk-Ho Choi
Kyung Hee University, Korea

Graphene-Based semiconductor heterostructures for optoelectronic devices

A wide variety of optoelectronic devices based on graphene has been and are still being studied, and some of them have already reached a level of competitiveness comparable to conventional semiconductor devices. However, single-layer graphene has low light absorbance (only 2.3%) in the ultraviolet to near infrared region, short light-matter interaction length, and high sheet resistance, unfavourable for light harvesting applications. In addition, the ultra-short lifetime of excitons in pure graphene resulting from its gapless nature also leads to fast carrier recombination, which limits the efficient production of photocurrent or photovoltage. However, graphene transparent conductive electrodes are highly attractive for optoelectronic device applications due to their extremely-high carrier mobilities, almost-perfect transmittance, and high flexibility, and the sheet resistance can be lowered by a simple doping technique. The emergence of graphene/semiconductor hybrid heterostructures provides a platform useful for fabricating high-performance optoelectronic devices such as photodetectors, solar cells, and light-emitting diodes, thereby overcoming the inherent limitations of graphene. Here, I report our recent studies of optoelectronic devices based on graphene/semiconductor hybrid heterostructures, composed of graphene, graphene quantum dots, Si quantum dots/nanowires, perovskites, organic materials, and GaN, with being assisted by doping of graphene.

Biography: Suk-Ho Choi is a professor in the Dept. of Applied Physics at Kyung Hee Univ. (KHU). He received BS from Seoul National Univ., MS and PhD from Korea Advanced Institute of Science and Technology (KAIST). He spent sabbatical years at National Institute of Standards and Technology (USA), Australian National University, and Samsung Institute of Technology. He worked as a director at Institute of Natural Sciences at KHU, and was appointed as Fellow Professor from 2009. He has established two major areas of research, one on the optical and electrical properties of low-dimensional nanostructures such as quantum dots/nanowires/graphene/2D-related materials, and the other on their applications in optoelectronic devices. He has published over 210 papers.

sukho@khu.ac.kr