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A hybrid MoS² nanosheet–CdSe nanocrystal phototransistor with a fast photoresponse als

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2-Dimensional (2D) and 0-dimensional (0D) hybrid nanostructures have been reported as promising new systems for highly-sensitive and wavelength-tunable photodetectors. Although the performance of hybrid photodetectors was enhanced by charge injection from 0D nanocrystals (NCs) to 2D nanosheets (NSs), the response time of hybrid photodetectors is still very slow due to the trapping and leakage of residual carriers at the interfaces of the hybrid materials. Here, we demonstrate a MoS₂/CdSe hybrid phototransistor with enhanced responsivity of $2.5 \times 10^5 \text{ A W}^{-1}$ and detectivity of 1.24×10^{14} Jones. In addition, the device exhibited a fast rise (τ_{rise}) and decay time (τ_{decay}) of 60 ms, respectively. The mechanism for the improved photoresponse time has been discussed using a charge injection model in an n–n type heterojunction energy band diagram of hybrid materials.

Biography

Jong-Soo Lee has been an associate professor at Department of Energy Systems Engineering in DGIST since July 2012. He earned his PhD degree in Metallurgical Engineering in 1999 from Chonbuk National University, Republic of Korea. As a research specialist in 2007-2012, He worked with Prof. Dmitri Talapin at the University of Chicago, Department of Chemistry. His group research focus on the synthesis and development of novel strategies for the surface modification of colloidal nanostructures, which can apply as nanomaterial-based electronic, optoelectronic, and hydrogen generation applications.

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