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### MoSe<sub>2</sub>/Si and MoSe<sub>2</sub>/GaAs Heterojunctions for Photodetector Applications

Limitation of application of two dimensional gapless graphene for optoelectronic devices has been overcome by using two dimensional transition metal dichalcogenides (TMDs), which are structural analogue of graphene but has a layer dependent finite band gap. In this work, photodetectors based on heterojunction of MoSe<sub>2</sub> nanosheets with p-Si as well as n-GaAs have been demonstrated. Photodetectors based on MoSe<sub>2</sub>/Si and MoSe<sub>2</sub>/GaAs heterostructures exhibited a photo to dark current ratio of 26 and  $5.8 \times 10^3$ , respectively, at a bias of -2V. The peak responsivity of MoSe<sub>2</sub>/GaAs based photodetectors was also observed to be higher as compared to the photodetectors based on MoSe<sub>2</sub>/Si. The peak responsivity of MoSe<sub>2</sub>/GaAs based photodetectors as estimated from EQE curve was found to be  $\sim 450$  mA/W at zero bias whereas peak responsivity of MoSe<sub>2</sub>/Si based photodetectors was found to be  $\sim 320$  mA/W at a bias of -2V. Although the photodetector based on heterojunction with Si showed a wider photoresponse as compared to the photodetector based on GaAs, due to absorption in NIR region by Si, but the heterojunction device with GaAs exhibited a superior photo to dark current ratio and higher peak spectral responsivity in visible region because of higher absorption of visible light by direct band gap GaAs as compared to Si. These results indicate that heterojunction photodetectors on GaAs platforms are better alternative for photodetection in visible region. This study would pave the way for designing a new type of heterostructures for their potential application in next generation photonic devices.

### Biography

Susnata Bera has completed her PhD from Indian Institute of Technology, Kharagpur and postdoctoral studies from Indian Institute of Technology, Delhi, India. Currently she is working as an Assistant Professor of Physics in Vivekanda Mission Mahavidyalaya, West Bengal, India. She has vast experience in various semiconductor device fabrications and published more than 25 papers in reputed journals and conferences.

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