Band-gap modulation of 2D semiconductors for photoelectrochemical biosensing

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Abstract

Given the ever-growing demand for new and advanced techniques in biosensing and bioanalytics, the incorporation of photoelectrochemical (PEC) technology for such analysis has risen in popularity and is becoming a rapidly developing field. Several advantages of PEC biosensing platforms include simple operation, cost effective instrumentation requirements, wide calibration ranges, and the potential for miniaturisation and, due to the separation and different energy forms employed, have shown to possess impressive sensitivities with reduced background signals over conventional electrochemical methods.[1] One of the most crucial elements of any PEC platform is the selection of the photoactive material and its photoelectric transformation efficiency. In recent years, semiconducting nanomaterials have become one of the most widely used photoactive materials in PEC platforms[2] as the states of the valence and conduction bands, and subsequently the band gap, can be easily modulated and tailored for specific applications. In this work, we couple a graphene analogue with a transitional metal dichalcogenide to highlight the importance of band-gap modulation for PEC biosensing.

References

[1] Zhao, W.-W., J.-J. Xu, and H.-Y. Chen, Chemical Reviews, 114 (2014) 7421-7441.

[2] Zhao, W.-W., J.-J. Xu, and H.-Y. Chen, Chemical Society Reviews, 44 (2015) 729-741.