

Department of Applied Physics



Prof. LAU Shu Ping

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Education	Ph.D. University of Wales Swansea B.Sc. The Polytechnic of North London
Research Interests	Optoelectronic Properties, Two-dimensional Materials, Graphene, Graphene Quantum Dots, MoS ₂ , Black Phosphorus
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Publication	344
H-index	49
Sum of the Times Cited	10069

Awards and Honours

- Silver Prize and Special Merit Award at the Seoul International Invention Fair (2015)
- Nanyang Award for Research and Innovation (2006)

Patents

- S.P. Lau**, J.S. Qian, "Improved MnO₂ anode for Li-ion and Na-ion batteries", US patent, filed in May 2017.
- S.P. Lau**, J.S. Qian, J.K. Yuan, "Method for preparing aqueous MnO₂ ink and capacitive energy storage devices comprising MnO₂", US Patent, filed in March 2017.
- S.P. Lau**, M. Cholewa, G-C. Yi, J.K. Yoo, A.P. Burden, L. Huang, X.Y. Gao, T.S.A. Wee, H.O. Moser, "Radiation detector having coated nanostructure and method", US patent no. 7388201, granted on 18 June 2008.

Publications (selected)

Five recent papers:

- S.H. Lin, Y. Liu, Z.X. Hu, W. Lu, C.H. Mak, L.H. Zeng, J. Zhao, Y.Y. Li, F. Yan, Y.H. Tsang, X.M. Zhang, **S.P. Lau**, "Tunable active edge sites in PtSe₂ films towards hydrogen evolution reaction", *Nano Energy* 42 (2017) 26-33.
- C.P. Lee, K.Y. Lai, C.A. Lin, C.T. Li, K.C. Ho, C.I. Wu, **S.P. Lau**, J.H. He, "A paper-based electrode using a graphene dot/PEDOT:PSS composite for flexible solar cells", *Nano Energy* 36 (2017), 260-267.
- M.L. Tsai, D.S. Tsai, L.B. Tang, L.J. Chen, **S.P. Lau**, J.H. He, "Omnidirectional harvesting of weak light using a graphene quantum dot-modified organic/silicon hybrid device", *ACS Nano* 11 (2017) 4565-4570.

- Y.Y. Li, Z. Hu, S.H. Lin, S.K. Lai, W. Ji, **S.P. Lau**, "Giant Anisotropic Raman Response of Encapsulated Ultrathin Black Phosphorus by Uniaxial Strain", *Advanced Functional Materials* 27 (2017) 1600986.
- S. Lin, Y.S. Chui, **S.P. Lau**, Liquid-phase exfoliation of black phosphorus and its applications, *FlatChem* 2 (2017), 15-37.

Five highly cited papers:

- Y.Y. Li, Z. Hu, S.H. Lin, S.K. Lai, W. Ji, **S.P. Lau**, "Giant Anisotropic Raman Response of Encapsulated Ultrathin Black Phosphorus by Uniaxial Strain", *Advanced Functional Materials* 27 (2017) 1600986.
- Y. Wang, R. Fullon, M. Acerce, C.E. Petoukhoff, J. Yang, C. Chen, S. Du, S.K. Lai, **S.P. Lau**, D. Voiry, D. O'Carroll, G. Gupta, A. D. Mohite, S. Zhang, H. Zhou, M. Chhowalla, "Solution-Processed MoS₂/Organolead trihalide perovskite photodetectors", *Advanced Materials* 29 (2017) 1603995.
- L.B. Tang, R.B. Ji, X.M. Li, G.X. Bai, C.P. Liu, J.H. Hao, J.Y. Lin, H.X. Jiang, K.S. Teng, Z.B. Yang, **S.P. Lau**, "Deep Ultraviolet to Near-Infrared Emission and Photoresponse in Layered N-Doped Graphene Quantum Dots", *ACS Nano* 8 (2014) 6312-6320.
- Y.Y. Hui, X. Liu, W. Jie, N.Y. Chan, J. Hao, Y.T. Hsu, L. J. Li, W. Guo, **S. P. Lau**, "Exceptional Tunability of Band Energy in a Compressively Strained Trilayer MoS₂ Sheet", *ACS Nano* 7 (2013) 7126-7130.
- L.B. Tang, R.B. Ji, X. K. Cao, J.Y. Lin, H.X. Jiang, X.M. Li, C.M. Luk, S.J. Zeng, J.H. Hao and **S. P. Lau**, "Deep Ultraviolet Photoluminescence of Water-Soluble Self-Passivated Graphene Quantum Dots", *ACS Nano* 6 (2012) 5102-5110.

Research Overview

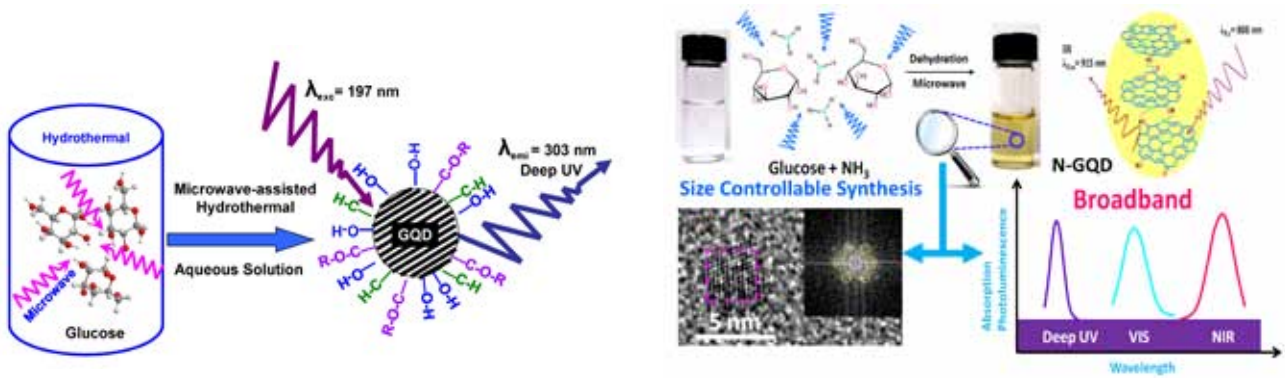
Prof. Lau's primary research focus is in the area of nanoscale semiconductor materials including 2D materials and quantum dots. He has made significant and pioneering contributions to the material growth and photonic device fabrication, fundamental understanding, and practical applications of 2D materials and quantum dots.

Current Research Projects

- GRF: Strain-engineered atomically thin transition metal dichalcogenides for solar energy funnels
- GRF: Anisotropic strain engineering in atomically thin black phosphorus
- GRF: Pulsed laser deposited amorphous black phosphorus field effect transistors and its heterostructures

Ultrabroad Band Graphene Quantum Dots (GQDs)

- Emission of GQDs can be tuned effectively by doping Cl, S and N
- N-GQDs exhibit deep UV to NIR emission and photoresponse



Strain Engineering in Two-dimensional Layered Materials

- PMN-PT substrate could be an excellent platform to study a wide-range of 2D materials
- Patterned substrates could be an effect way to induced large strain to 2D materials
- Giant anisotropic Raman response in BP

