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MQ Photonics Research Centre Seminar

Wednesday, 13 October 2021, 2:00 pm (Sydney time)

(Zoom link: <https://macquarie.zoom.us/j/85829287435>)

Two-dimensional metal oxides: a paradigm for optics-based chemical sensing

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Abstract:

The discovery of graphene inspires the exploration of the atomically thin 2D structure in various layered elements and compounds ranged from insulators, semiconductors, semimetals, and metals, possibly revolutionizing the fields across electronics, optics, catalysis, and sensing. In this seminar, I will introduce our recent research progress on the development of 2D intrinsic and doped metal oxides as well as the use of their peculiar optical properties for high-performance chemical sensing. Upon the engineering of the 2D MoO₃ host with oxygen vacancies, NH₄⁺, or H⁺, an insulator-to-metal transition occurs with the emerging plasmonic properties tunable across the whole visible spectrum and the near-red end of the near-infrared region by the number of dopants or vacancies. Compared to the conventionally noble metal-based plasmonic chemical sensors relying on the change of the ambient refractive index, these degenerate semiconductors lead to the realization of plasmonic chemical sensors additionally mediated by the charge transfer.

Speaker biography:

A/Prof Jian Zhen Ou is a former ARC DECRA Fellow and currently leads a research team at RMIT University for developing nanomaterial-enabled sensors. His research interests include two-dimensional materials, chemical and biological sensing, nanoscale electronics, and artificial intelligence-driven sensors. He has over 130 peer-reviewed publications in top journals including *Nature Materials*, *Nature Communications*, *Advanced Materials*, *Nano Today*, *ACS Nano*, *Nano Letters*, and *Advanced Functional Materials*. He was the recipient of several prestigious awards, including Victoria Fellow (2017), Malcolm Moore Industry Award by RMIT (2017), Research Award of Excellence-ECR (Technology) by RMIT (2016), and Europe AMA Innovation Award Finalist by Association of Sensors + Measurement (2016). He was also selected as the top emerging leader in Engineering and Computer Science by The Australian Research Magazine in both 2018 and 2019. A/Prof Ou is currently holding four international patents on “Human Gas Sensing Capsule” and has been the scientific advisor for RMIT’s spin-off company Atmo Biosciences Ltd since 2019.

