

Environmental Research, Technology Demonstration and Conference Project

ECF Project:	ECF 2022-111
Project Title:	Environment and Conservation Fund - Flexible and ultralow-power consumption air quality sensor based on wafer- scale 2D material
Principal Investigator:	Dr Chow Chi Yung Philip, Department of Mechanical Engineering, The University of Hong Kong
Total Approved Grant:	\$500,000 (ECF & WWGF: 50/50)
Duration:	1/9/2023 to 31/8/2025
Project Status/Remarks:	On-going
Project Scope:	<p>Real-time monitoring of air pollutants for Internet-of-Things is of vital importance. Today's electronic gas sensors are based on metal oxide nanostructures that exhibit a resistance change upon the adsorption of gases. There are three major problems with this technology: first, metal oxide sensors have high power consumption because they can only operate at high temperatures (between 150 and 400°C); second, their sensitivity is limited to parts-per-million (ppm) level; third, they are bulky and inflexible, thus limiting their integration with wearable electronics and the environment.</p> <p>Recent research has highlighted the potential of using novel two-dimensional (2D) materials such as MoS₂ for air pollutant sensors. Thanks to their unparalleled surface-to-volume ratio, 2D gas sensors can operate at room temperature with ultralow power consumption, have parts-per-billion (ppb) sensitivity and are inherently flexible and lightweight. However, the development of this new technology is still in its infancy, with lab-scale prototypes made using mechanically exfoliated 2D samples (not scalable). Therefore, taking advantage of the state-of-the-art 2D material synthesis platform at HKU, this project targets to develop high-performance air pollutant sensors based on wafer-scale 2D materials with ultralow-power consumption. The project results will path the way towards industrial-scale manufacturing of high-performance air pollutant sensors based on 2D materials.</p>
Summary of the Findings/ Outcomes:	To be available upon completion of the project