InP nanowire arrays for gas sensing applications

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Recent years there is growing demands for gas sensors that are able to specifically detect and monitor gases over the broad range of concentrations and high reliability in environmental and biological systems.[1] So far a majority of reported high-performance gas sensors are based on nanostructured metal oxide semiconductors due to their fast response, high precision, and small size.[2] However, most of them require high operation temperatures (300-500 °C), resulting in high energy-consumption and cost.[3]
Conventional semiconductors, such as Si,[4] InP,[5] InAs[6] have also been investigated in the past as chem-resistor gas sensors, but slow response and poor selectivity limit their development. Owing to large surface-to-volume ratio, excellent electrical and optical property, tuneable size and chemical composition,[7] III-V compound semiconductor nanowires offer a promising platform for next-generation sensors.[8]
In this work, we aim to fabricate ordered vertical InP semiconductor nanowire arrays for gas sensing applications (see Fig. 1) by top-down etching method. Sensing performance of the devices can be enhanced by controlling the diameter, pitch size and surface functionalization of nanowires. This project provides a novel nanomaterial platform for development of high-performance gas sensors for applications including diagnosis of type I Diabetes, one of the core projects of the OHIOH program.

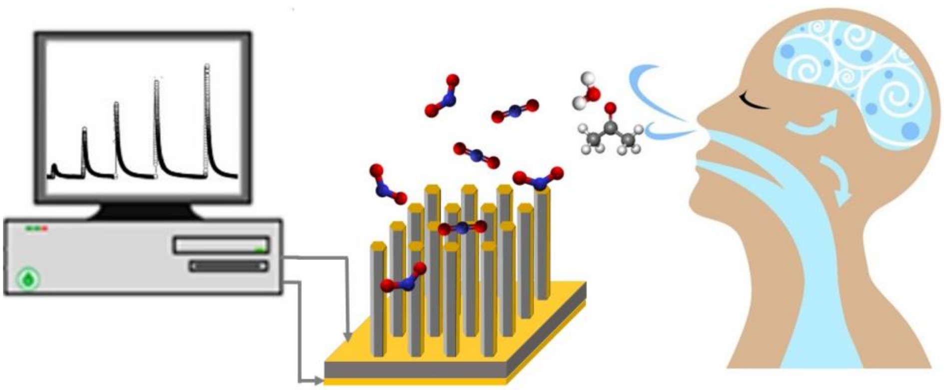

Figure 1: Gas sensor and clinical diagnosis application.

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