Dynamic modulation of spectral response with nanowire photodetectors

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Multispectral photodetectors have great potential for a wide array of applications, as it is able to capture spectral bands other than red, green, and blue. Previously, the development of multispectral photodetectors is focused on the silicon platform, which restricts the spectral range to be between 350 nm to 1100 nm. In this work, we still leverage the technological maturity of silicon platform, by using epitaxially grown germanium on silicon as the starting material. This implies a further extension of spectral range to 1600 nm on the infrared side. This spectral range is important as it covers signature peaks of chemical compounds such as nitrates and cellulose lignin. We show that the extension does not diminishing the visible spectral photo-response, as we form nanostructured active region to obtain the spectral selectivity by design. For these nanostructures, we use graphene to form the top contact, which maximized the dielectric contrast between the nanostructure and the surrounding environment (see Fig. 1). Thus, we may engineer the nanostructures to have optimal amount of absorption and its locality. In addition, we demonstrate that the surface states play a role in the spectral selectivity of the nanowire detectors.

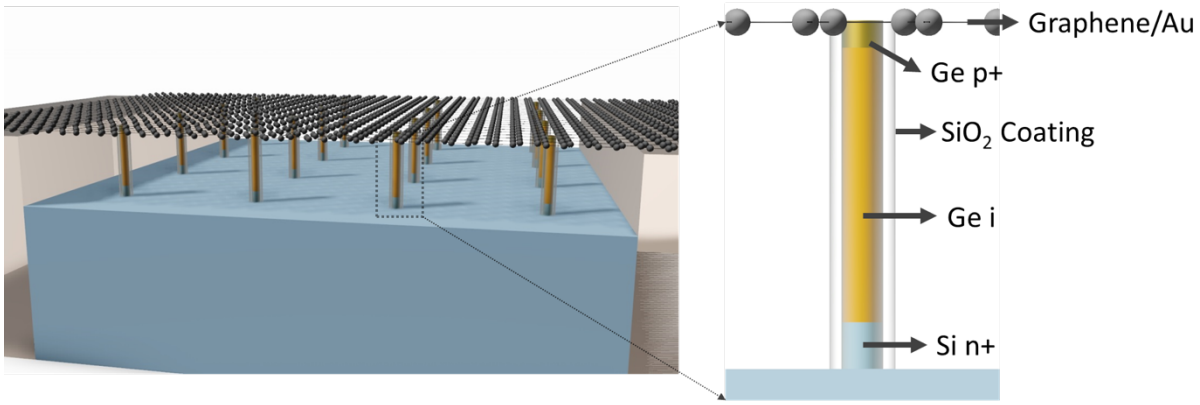

Figure 1. The architecture of the Germanium on Silicon Nanowire Photodetector

[1] The experimental work was performed when the author was in the University of Melbourne, Victoria, Australia and the research group led by Professor Kenneth Crozier.