
2D Semiconducting Electronic Devices for Sensor Applications

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Flexible mobile healthcare devices show the most rapidly developing electronics in due to advances in novel flexible processes, novel sensing materials, ultrathin devices and sensors, and flexible/stretchable material. Various nanomaterials and nanostructures, including silicon nanowires (NW) and carbon nanotubes have been actively investigated to improve the sensitivity in sensor applications. Furthermore, two-dimensional (2-D) nanomaterials, including graphene and transition metal dichalcogenides (TMDs), have shown great potential as ultra-sensitive sensors. An atomically thin active layer enables a high surface-to-volume ratio, resulting in a superior charge sensitivity. However, the existence of a bandgap in the TMDs unlike the zero-bandgap in graphene is critical for the FET-based platform. In this talk, toward practical applications of 2D sensors, we will introduce several topics; 1) MoS₂ biosensor and chemical sensor for point-of-care diagnostics, 2) Novel flexible process using solution-based polyimide substrate, 3) Giant photo-amplification in multilayer 2D semiconducting phototransistors.