

A comprehensive review on the utilisation of layered materials as sensors

Hemanga Jyoti Sarmah

Department of Physics, Morigaon College (Autonomous), Morigaon 782 105, India

A sensor is a device which can detect and determine the quantity of presence of a selected target. Layered nanomaterials, i.e., the materials in one-dimensional confined form, are rapidly used as sensors due to their large surface area. Graphene and its derivatives, transition metal dichalcogenides, phosphene, boron nitride, different hetero-structures, etc., have been found suitable for sensing applications. To date, gas sensors, bio-molecule sensors, humidity sensors, pH sensors, etc., are being fabricated using different layered materials.

Keywords: 2D materials, bio-molecule sensor, gas sensor, humidity sensor, limit of detection, pH sensor, sensitivity.

on graphene and its derivatives, metal oxides, transition metal dichalcogenides, MXenes, boron nitride (*h*-BN), etc., have been reported in the existing literature⁶. To be mentioned, due to the unique morphology, these materials possess a large surface area, which enhances the sensing performance compared to that of other morphologies. Moreover, the sensitivity of sensors based on 2D materials can be tuned easily by changing the thickness of the flacks, simply by altering the synthesis protocol. It has been confirmed that defective 2D materials, because of the presence of unsaturated bonds, are more sensitive to foreign elements and considered to be better candidates for the sensors^{9,10}. In this regard, there is a lot of demand for defect engineering in the host matrix. Different irradiation techniques, starting from ion irradiation in low and high energy regimes, electron beams, and gamma rays, have been used to create defects in 2D materials.