

# **Bi<sub>2</sub>Te<sub>3</sub> Incorporated Graphene for H<sub>2</sub> Gas Detection**

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**Abstract**—*The recently discovered second generation of TIs such as Bi<sub>2</sub>Te<sub>3</sub> has drawn much attention in device applications because of its potential applications in tuning the transport properties of TI based devices. Graphene, strictly a 2D material with entire surface exposed to the environment makes it highly efficient for detecting adsorbed molecules. Bi<sub>2</sub>Te<sub>3</sub> embedded Graphene-based nanocomposites have proven to be very promising materials for gas sensing applications. In this paper, we present a general approach for the preparation of graphene–Bi<sub>2</sub>Te<sub>3</sub> nanocomposite. Graphene–Bi<sub>2</sub>Te<sub>3</sub> nanocomposite thin-layer sensors were prepared by drop coating the dispersed solution onto the alumina substrate. These nanocomposites were used for the detection of H<sub>2</sub> gas. TEM micrographs showed that Bi<sub>2</sub>Te<sub>3</sub> nanoparticles were well distributed on graphene nano sheets. Three different loadings (0.2, 0.5 and 0.1 wt %) of graphene with Bi<sub>2</sub>Te<sub>3</sub> were used for the gas sensing measurements. It was observed that the sensor response to H<sub>2</sub> increased nearly two times in the case of graphene–Bi<sub>2</sub>Te<sub>3</sub> nanocomposite layer as compared to a pure Bi<sub>2</sub>Te<sub>3</sub> layer.*