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Gase sensing using on terahertz emissions from graphene-coated InP surfaces TONOUCHI MASAYOSHI, IWAO KAWAYAMA, YUKI SANO, KHANDOKER SALEK, HIRONARU MURAKAMI, Osaka University, MIKA TABATA, MINJIE WANG, JUNICHIRO KONO, ROBERT VAJTAI, PULICKEL AJAYAN, Rice University — Electrical and optical properties of graphene are known to be affected by the adsorption of gas molecules, which can be used for developing a highly sensitive gas sensor. In this study, we demonstrate a new approach for environmental gas sensing using terahertz emission from graphene-coated semiconductor wafers. Specifically, we show that the waveforms of terahertz radiation from graphene-coated InP sensitively change with the type of the atmospheric gas and the laser illumination time. The change of the terahertz waveforms in different environmental gases can be explained by modification of the surface depletion-layer potential of InP due to the surface dipole induced by the adsorbed gas molecules. Moreover, additional UV light illumination enhances the change of terahertz waveforms in oxygen, apparently due to photo-oxidation of graphene. We have developed a theoretical model that can explain these experimental observations in a semi-quantitative manner.

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