MoS_2-graphene interface for molecular sensing and switching

Abha Misra
Department of Instrumentation and Applied Physics, Indian Institute of Science, Bangalore, Karnataka, India 560012

This talk encompasses molecular response study of atomically thin heterostructures combining molybdenum disulfide (MoS_2), graphene, and hexagonal boron nitride (h-BN). The defect induced interfacial states are created in an atomically thin two-dimensional MoS_2 channel by underlying a narrow pattern of a graphene layer in a field-effect transistor. The presence of interfacial states in the channel leads to a conductance fluctuation. Its magnitude is modulated nearly three-order of magnitude at room temperature using the nitrogen dioxide gas molecules in the subthreshold region. The study provides a systematic experimental approach to establish a correlation between modulated conductance fluctuation and the molecular concentration up to parts-per-billion. First-principles density functional theory further explains the role of unique interfacial configuration on conductance fluctuation. The study determines a novel approach to induce charge-state for the modulation of carrier concentration and exploits the role of defect induced interfacial states in atomically thin interfaces for the molecular interaction.

Teams
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