

Abstract Submitted  
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**Terahertz time-domain spectroscopy of large-area graphene on various substrates** IWAO KAWAYAMA, MAKOTO OHSHIRO, YUKI SANO, HIRONARU MURAKAMI, Osaka University, JAMES ALLRED, MINJIE WANG, JUNICHIRO KONO, ROBERT VAJTAI, PULICKEL AJAYAN, Rice University, MASAYOSHI TONOUCI, Osaka University — The advent of large-area graphene samples has opened up tremendous new opportunities for terahertz and infrared optoelectronic devices as well as for fundamental studies of low-energy excitations in graphene in the terahertz frequency range. While there have been extensive studies on the strong influence of the supporting substrate and the local molecular environment on the optical and DC transport properties of graphene, no systematic studies exist on their effects on graphene's terahertz properties. In this study, we a terahertz time-domain spectroscopy study of large-area graphene mono-layers on various terahertz-transparent substrates (e.g., InAs, InP, GaAs, MgO, and polypropylene). We found that the terahertz optical conductivity spectrum shows qualitatively different behaviors, depending on the substrate, which can be understood through substrate-induced doping and defects as well as interaction with substrate phonons. In addition, we observed that the effects of adsorbed gas molecules on the terahertz conductivity also vary, depending on the substrate.

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