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Title:Spectrally wide-band terahertz wave modulator based on optically tuned graphene
Authors:Weis, Peter (1); Garcia-Pomar, Juan L. (1); Höh, Michael (1); Reinhard, Benjamin (1); Brodyanski, Alexander (3); Rahm, Marco (1)
Author affiliation:(1) Department of Physics, Research Center OPTIMAS, University of Kaiserslautern, Erwin-Schroedinger-Strasse, 67663 Kaiserslautern, Germany; (2) Fraunhofer Institute for Physical Measurement Techniques IPM, Heidenhofstrasse 8, 79110 Freiburg, Germany; (3) Institut für Oberflächen- und Schichtanalytik IFOS GmbH, Research Center OPTIMAS, Trippstadter Strae 120, 67663 Kaiserslautern, Germany
Corresponding author:Rahm, M.(mrahm@physik.uni-kl.de)
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Abstract:New applications in the realms of terahertz (THz) technology require versatile adaptive optics and powerful modulation techniques. Semiconductors have proven to provide fast all-optical terahertz wave modulation over a wide frequency band. We show that the attenuation and modulation depth in optically driven silicon modulators can be significantly enhanced by deposition of graphene on silicon (GOS). We observed a wide-band tunability of the THz transmission in a frequency range from 0.2 to 2 THz and a maximum modulation depth of 99%. The maximum difference between the transmission through silicon and GOS is Δt = 0.18 at a low photodoping power of 40 mW. At higher modulation power, the enhancement decreased due to charge carrier saturation. We developed a semianalytical band structure model of the graphene-silicon interface to describe the observed attenuation and modulation depth in GOS. © 2012 American Chemical Society.
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