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Title:Graphene-based devices in terahertz science and technology
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Abstract:Graphene is a one-atom-thick planar sheet of a honeycomb carbon crystal. Its gapless and linear energy spectra of electrons and holes lead to nontrivial features such as giant carrier mobility and broadband flat optical response. In this paper, recent advances in graphene-based devices in terahertz science and technology are reviewed. First, the fundamental basis of the optoelectronic properties of graphene is introduced. Second, synthesis and crystallographic characterization of graphene material are described, particularly focused on the authors' original heteroepitaxial graphene-on-silicon technology. Third, nonequilibrium carrier relaxation and recombination dynamics in optically or electrically pumped graphene are described to introduce a possibility of negative-dynamic conductivity in a wide terahertz range. Fourth, recent theoretical advances towards the creation of current-injection graphene terahertz lasers are described. Fifth, the unique terahertz dynamics of the two-dimensional plasmons in graphene are described. Finally, the advantages of graphene devices for terahertz applications are summarized. © 2012 IOP Publishing Ltd.
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- Science and Technology - Tera Hertz - Terahertz applications - Terahertz dynamics - Terahertz lasers - Terahertz range

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