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摘要: The gapless energy spectra and linear dispersion relations of electrons and holes in graphene lead to nontrivial features such as a high carrier mobility and a flat, broadband optical response. This article reviews recent advances in graphene-based materials and devices for terahertz science and technology. After an introduction to the fundamental basis of the optoelectronic properties of graphene, the synthesis and crystallographic characterization of graphene materials are described, with a particular focus on the authors' original heteroepitaxial graphene-on-silicon technology. The nonequilibrium dynamics of carrier relaxation and recombination in optically or electrically pumped graphene is discussed to introduce the possibility of negative dynamic conductivity over a wide terahertz range. Recent theoretical advances toward the creation of current-injection graphene terahertz lasers are described, followed by the unique terahertz dynamics of two-dimensional plasmons in graphene. Finally, the advantages of graphene materials and devices for terahertz applications are summarized.
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