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Title:Very slow cooling dynamics of photoexcited carriers in graphene observed by optical-pump terahertz-probe spectroscopy
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Abstract:Using optical-pump terahertz-probe spectroscopy, we study the relaxation dynamics of photoexcited carriers in graphene at different substrate temperatures. We find that at lower temperatures the tail of the relaxation transients measured by the differential probe transmission become slower, extending beyond several hundred picoseconds below 50 K. We interpret the observed relaxation transients as resulting from the cooling of the photoexcited carriers via phonon emission. The slow cooling of the photoexcited carriers at low temperatures is attributed to the bulk of the electron and hole energy distributions moving close enough to the Dirac point that both intraband and interband scattering of carriers via optical phonon emission become inefficient for removing heat from the carriers. Our model, which includes intraband carrier scattering and interband carrier recombination and generation, agrees very well with the experimental observations.
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