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Negative Photoconductivity and Carrier Heating in CVD Graphene[1] JAMES HEYMAN, BANTEAYMOLU ALEBACHEW, ANDREW BANMAN, ZOFIA KAMINSKI, RHYAN FOO KUNE, JACOB STEIN, Macalester Coll, AARON MASSARI, Department of Chemistry, University of Minnesota, JEREMY ROBINSON, Naval Research Laboratory — Ultrafast photoexcitation of CVD graphene typically leads to a transient *decrease* in conductivity. Previous reports identify two possible mechanisms for this decrease: carrier heating leading to a decrease in mobility, and a photo-induced population inversion producing a negative dynamic resistance. We present time-resolved THz transmission (TRTS) measurements which show that population inversion is not required to observe negative photoconductivity in CVD graphene and confirm the role of carrier heating. In p-type CVD graphene samples interband optical transitions are blocked for pump photon energies less than twice the Fermi energy. However, our pump photon-energy resolved TRTS measurements exhibit negative photoconductivity at all pump wavelengths investigated, indicating that interband excitation leading to population inversion is not required to observe this effect. In addition, we have performed TRTS measurements on CVD graphene in magnetic fields that separately probe carrier mobility and population. We find that negative photoconductivity following photoexcitation primarily arises from a decrease in carrier mobility, confirming the role of carrier heating. Research at NRL was supported by the Office of Naval Research.

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