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A novel grating-imaging method to measure carrier diffusion coefficient in graphene KE CHEN, YAGUO WANG, Department of Mechanical Engineering, Texas Materials Institute, University of Texas at Austin, DEJI AKINWANDE, SETH BANK, Department of Electrical and Computer Engineering, Microelectronics Research Center, University of Texas at Austin, JUNG-FU LIN, Department of Geological Sciences, Jackson School of Geosciences, University of Texas at Austin — Similar to carrier mobility, carrier diffusion coefficient in graphene determines the response rate of future graphene-based electronics. Here we present a simple, sensitive and non-destructive technique integrated with ultrafast pump-probe spectroscopy to measure carrier diffusion in CVD-grown graphene. In the method, the pump and the probe beams pass through the same area of a photomask with metal strips i.e. a transmission amplitude grating, and get diffracted. The diffracted light is collected by an objective lens and focused onto the sample to generate carrier density grating. Relaxation of this carrier density grating is governed by both carrier recombination and carrier diffusion in the sample. Transient transmission change of the probe beams, which reflects this relaxation process, is recorded. The measured diffusion coefficients of multilayer and monolayer CVD-grown graphene are 2000cm^2/s and 10000cm^2/s, respectively, comparable with the reported values of epitaxial graphene and reduced graphene. This transmission grating technique can be used to measure carrier dynamics in versatile 2D materials.

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