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Ballistic transport in zigzag-edge graphene nanostrips[1] DANIEL GUNLYCKE, Naval Research Laboratory, HADLEY M. LAWLER, University of Washington, DENIS A. ARESHKIN, George Washington University, CARTER T. WHITE, Naval Research Laboratory — Graphene nanostrips (GNSs) constitute a class of materials where one of the two in-plane dimensions of graphene has a small finite width. We present results of zigzag-edge GNSs terminated with hydrogen atoms which suggest that ballistic transport may be possible over micrometer lengths. The single channel near the Fermi level appears to possess a natural resistance to back-scattering. Long-range disorder have a negligible back-scattering since the only allowed coupling requires a large crystal momentum change. We find that disorder on atomic scale and edge disorder have also little impact on the conductance in the single-channel window. Not only are the zigzag-edge GNSs resistent to static disorder, they may also offer longer electron-phonon mean-free paths which are longer than those in carbon nanotubes. Back-scattering in the conduction band requires a large transfer of crystal momentum from phonons which immediately eliminate long-wavelength acoustic phonon scattering. Therefore, it might be feasible to have single-channel ballistic transport in zigzag-edge GNSs at room temperature.

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