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Mechanical-Electric-Magnetic Coupling Effects in Black and White Graphenes WANLIN GUO, Key Lab of Intelligent Nano Materials and Devices of MOD, Institute of Nano Science, Nanjing University of Aeronautics & Astronautics — Nanoscale multifield couplings can turn very common materials such as carbon and boron nitride into promising functional materials for many device applications. We recently found that the magnetism in graphene nanoribbons on silicon substrates can be tuned linearly by applied bias voltage (***Phys.Rev.Lett***, **103**, 187204, 2009), and this novel magnetoelectric effect is robust to material and geometry variations. Adsorbed graphene nanoribbons can also create tunable magnetism on silicon surface (***Phys.Rev.B*** **82**, 235423, 2010). Strain tunable magnetism has also been found in defect graphene (***ACS Nano*** **4**, 2124, 2010; ***Phys. Rev. B*** **82**, 085425, 2010). Contrast to the zero-gap graphene, Hexagon-BN layers (white graphene) and rolled-up nanotubes are generally insulating, we show that the wide gap in them can be tuned into semiconducting range, even closed in BN nanoribbons by electric fields and narrowed by reduced tube diameter or local curvature radius (***Nano Lett.*** **10**, 5049, 2010; ***Phys. Rev. B*** **82**, 035412, 2010). What is more, our recent experiments have demonstrated that flow-induced-voltage in graphene can be 20 folds higher than in graphite (***Appl.Phys.Lett***. 99, 073103 (2011)). Such extraordinary mechanical-electric-magnetic coupling effects in graphene and BN systems open up new vistas in functional devices compatible with silicon-based technology for efficient energy conversion and novel functional systems.

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