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Photoluminescence from hydrogenated graphene[1] VOLODYMYR TURKOWSKI, TALAT S. RAHMAN, Physics Department and NSTC, University of Central Florida, Orlando FL 32816 — We consider the optical properties of hydrogenated graphene as a function of hydrogen concentration between the graphene and graphane limits. In particular, we show that with increasing hydrogen concentration the gap in the electron density of states grows from 0 to approximately 5eV in the case of graphane. For intermediate concentrations, additional electronic states with energies smaller than 5eV appear. These states make the system optically active in the visible range. We pay special attention to the possibility of ultrafast photoluminescence in the system for different values of hydrogen concentration and hole doping. For example, for excitations by ultrafast laser pulses, the system demonstrates significant visible range photoluminescence driven by the electron-phonon interaction. In the case of graphane, the effect can be significantly enhanced by hole doping, when the phonon spectrum demonstrates a Kohn anomaly, which results in a faster partial equilibration between the electrons and an optical phonon subsystem.

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