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Plasma Hydrogenation of n-Layer Graphene J.D. JONES, W.D. HOFFMAN, A.V. JESSEPH, C.J. MORRIS, G.F. VERBECK, J.M. PEREZ, University of North Texas — We propose a new mechanism for the hydrogenation of mono-, bi-, and tri-layer graphene samples using an H_2 plasma. We find that hydrogenation occurs as a result of electron irradiation of H_2O adsorbates on the sample rather than H species from within the plasma. We propose that the mechanism is electron-impact fragmentation of the H_2O adsorbates occurring naturally above and below the sample. The stability of the hydrogenation increases with the incident electron energy, allowing for hydrogenated samples that are stable at temperatures > 200 °C. We also observe fully hydrogenated bi- and tri-layer graphene, which may be evidence for new materials, diamane and *triamane*. Diamane, a two atom thick layer of hydrogenated diamond, is predicted to have a band gap of 3.12 eV and be stronger than graphane, hydrogenated graphene.

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