

Abstract Submitted
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Incommensurately Stacked Graphene Bi-Layer: A Raman Scattering Study¹ AWNISH GUPTA, Y. TANG, T. RUSSIN, V. CRESPI, P. EKLUND, Pennsylvania State University — We report results of Raman scattering studies of two novel graphene systems based on incommensurate stacking of sp^2 carbon: (1) an incommensurate bi-layer (IBL) formed by folding a graphene sheet onto itself; (2) a graphene scroll formed by rolling up a graphene sheet via a shearing motion between scotch tape and substrate during the micro-mechanical cleaving process. In (1), we have a flat bi-layer system; in (2) it is a gently curved multilayer system – both should be incommensurate. Interestingly, although no significant D-band is observed in the parent graphene system, the incommensurate contact of the graphene sheet in (1) and (2) leads to strong D-band scattering near 1350 cm^{-1} using 514.5 nm excitation. The dispersion of the D-bands in (1) and (2) is significantly different: scroll ($\sim 38\text{ cm}^{-1}/\text{eV}$) and IBL ($\sim 50\text{ cm}^{-1}/\text{eV}$). A second Raman band is observed nearby at $\sim 1384\text{ cm}^{-1}$ in both the IBL and the scroll. However, the $\sim 1384\text{ cm}^{-1}$ band is non-dispersive in both cases and is much sharper in the IBL than in the scroll. Our data will be compared to theoretical calculations based on double-resonant (DR) scattering and the electronic states of an IBL.

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