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Probing interlayer interactions in twisted bilayer graphene with Raman spectroscopy ROBIN HAVENER, Applied and Engineering Physics, Cornell University, LOLA BROWN, Chemistry and Chemical Biology, Cornell University, HOULONG ZHUANG, Materials Science and Engineering, Cornell University, MICHAL WOJCIK, Chemistry and Chemical Biology, Cornell University, CARLOS RUIZ-VARGAS, Applied and Engineering Physics, Cornell University, RICHARD G. HENNIG, Materials Science and Engineering, Cornell University, JIWOONG PARK, Chemistry and Chemical Biology, Cornell University — Chemical vapor deposition (CVD) growth or artificial layer-by-layer assembly of graphene typically produces multi-layer regions in which the layers are twisted with respect to each other, but the electronic and optical properties of this new material are still under investigation. In particular, little is known about how the twist angle affects the Raman signature of this material. We use a combination of dark-field transmission electron microscopy (DF-TEM) and widefield Raman imaging (WRI) to study the Raman signature of bilayer CVD graphene regions with known twist angles. We find that the intensities of the G and 2D peaks vary predictably with twist angle. In particular, we observe a strong G band enhancement at a specific twist angle that depends on our excitation energy. To explain this behavior, we model the electronic band structure of twisted bilayer graphene; the interaction between layers creates new saddle point van Hove singularities, and these energy states can enable a fully resonant G band pathway for a specific angle and excitation energy. This G band resonance feature is a very sensitive probe of twist angle and interlayer interactions.

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