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Raman spectroscopy of graphene under strain¹

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Raman spectroscopy is one of the most widely used characterization tools in graphene research. It has been used to estimate the number of layers, carrier concentration, edge types, thermal conductivity, etc. The effect of strain on the Raman spectrum of graphene is of particular interest, because the modification of the lattice due to strain is directly reflected on the Raman spectrum. Under uniaxial strain, the G and 2D bands of the Raman spectrum of single-layer graphene split due to the breaking of symmetry. From the polarization dependence of the split bands, one can determine the crystallographic orientation of the graphene sample. Furthermore, the splitting of the 2D band depends on the direction of the applied strain with respect to the crystallographic orientation, which provides critical information on the dominant scattering process responsible for this band. Bilayer graphene under uniaxial strain exhibits similar effects on the G and 2D bands, although the effect on the 2D band is rather complicated as each of the 4 components comprising the 2D band splits under strain. One can also estimate the thermal expansion coefficient and Young's modulus using Raman measurements under strain. Recent experimental results will be presented.

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