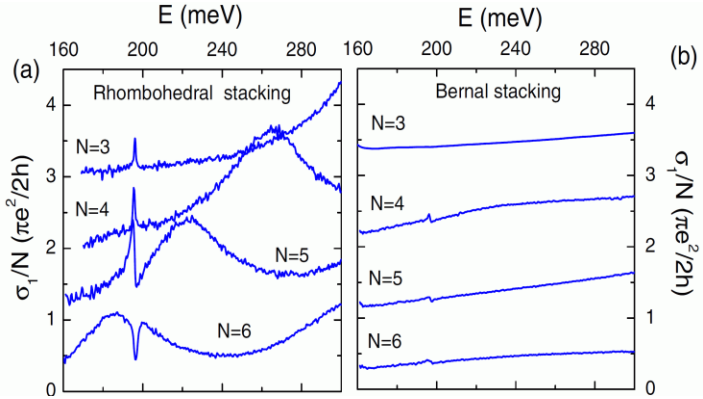
Infrared Absorption Boosted by Layering Sheets of Graphene



The infrared absorption due to both electronic transitions and phonons in few-layer (3 to 6 layers) graphene samples having rhombohedral (left) and Bernal (right) layer stacking. The highly asymmetric phonon contribution near 200 meV is a result of the coupling between the electrons and phonons.

Scientific Achievement

Found that infrared absorption from electronic transitions in rhombohedrally stacked (ABC) layers of graphene is 10 times greater than for Bernal (ABA) stacking; identified strong electron-phonon (e-ph) coupling that can play a key role in other electronic phenomena

Significance and Impact

Manipulating electronic properties of graphene through stacking order and thickness indicates that few-layer graphene is promising material for photo-detectors and tunable optical modulators or switches

Research Detail

- Team compared infrared absorption between few-layer graphene with different layer thicknesses and stackings of 3-6 layers.
- Observed a broad electronic absorption combined with asymmetric phonon components characteristic of Fano resonances arising from coupling between phonons and electronic continuum.

Z. Li, C.H. Lui, E. Cappelluti, L. Benfatto, K.F. Mak, G.L. Carr, J. Shan, T.F. Heinz, *Physical Review Letters* **2012**, 108, 156801

Work was performed at Columbia University and at Brookhaven National Laboratory.