

# Φ – 575 Διάλεξη 02

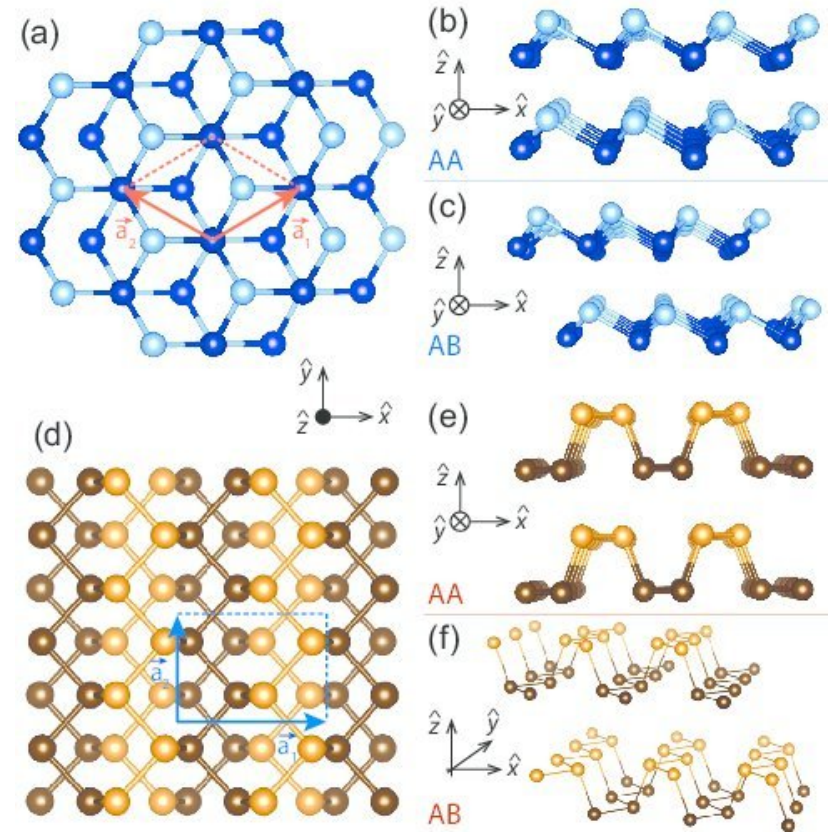
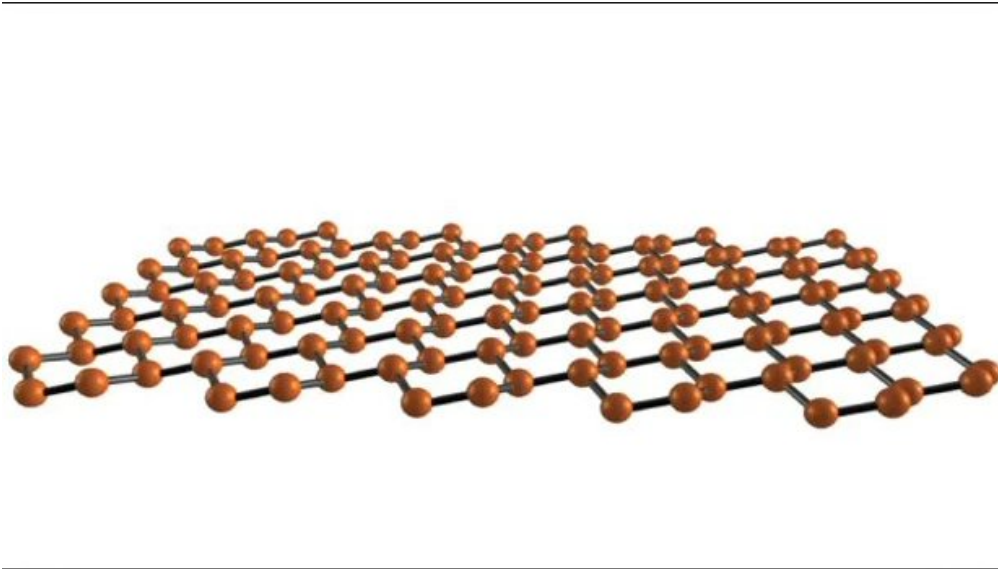
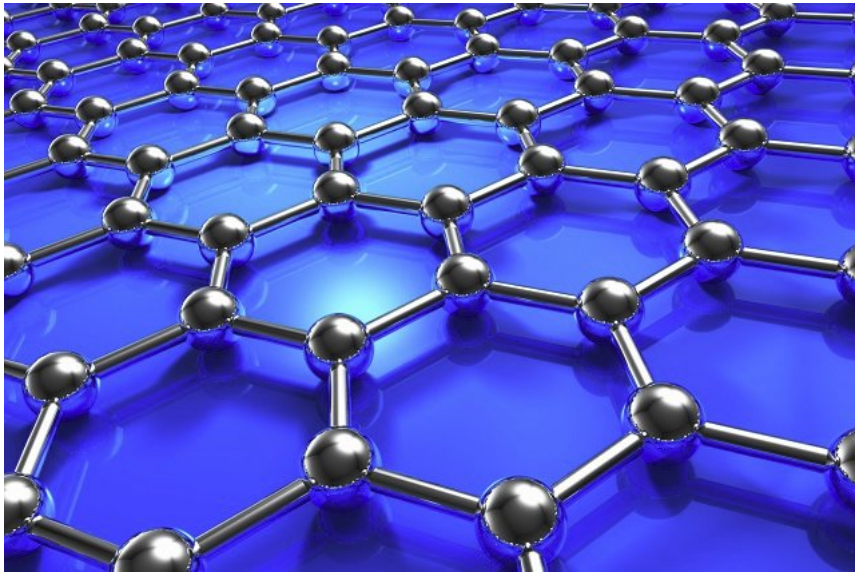
Φυσική διατάξεων δισδιάστατων ημιαγωγών

Γιώργος Δεληγεώργης ([deligeo@physics.uoc.gr](mailto:deligeo@physics.uoc.gr))

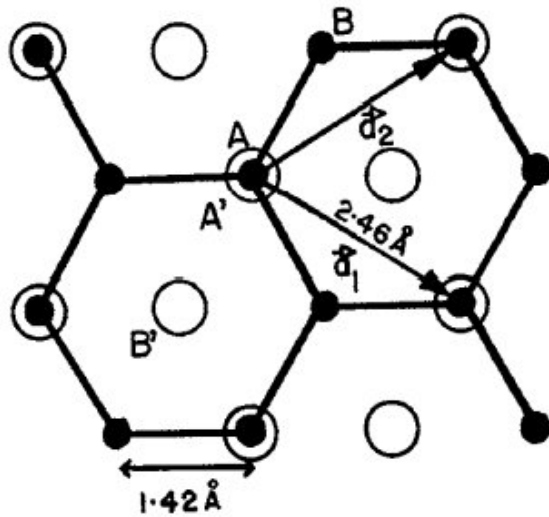




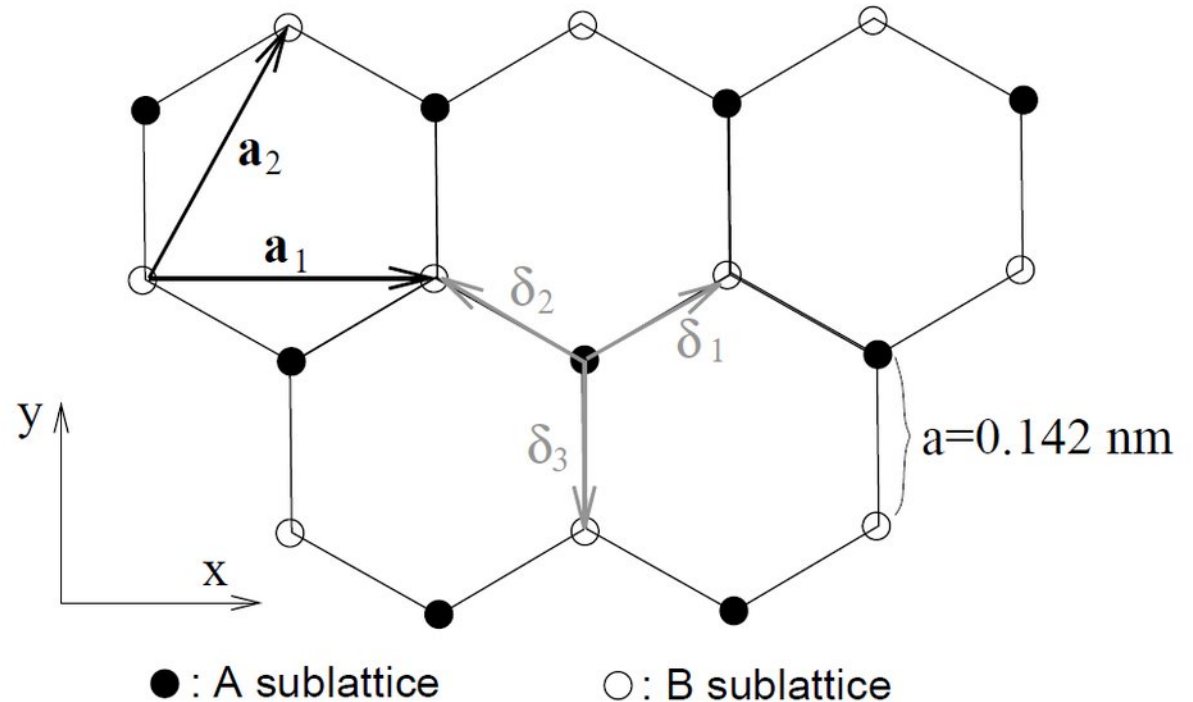
- Υλικά αποτελούμενα από 1 στοιχείο
  - Graphene
  - Germanene
  - Silicene
  - Phosphorene

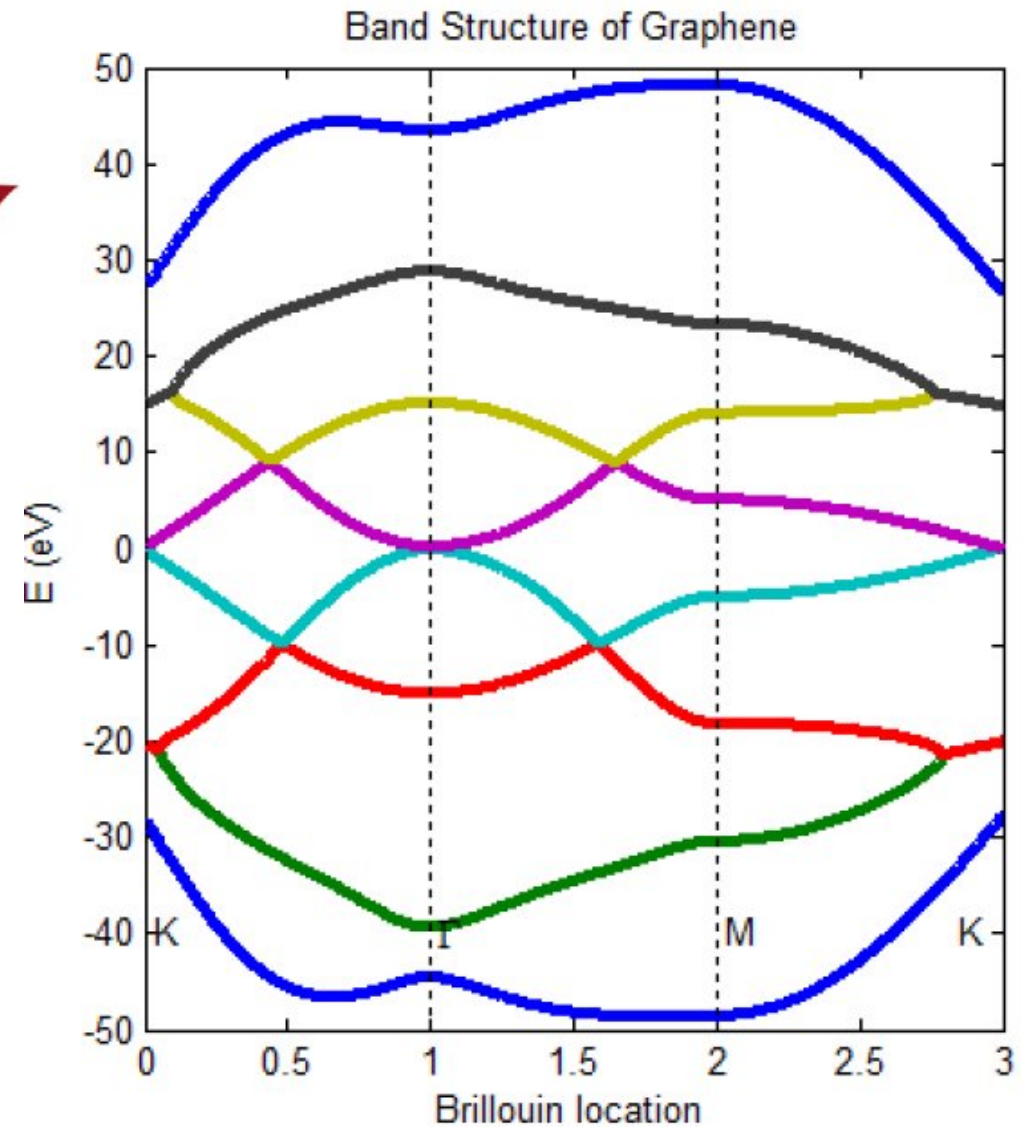
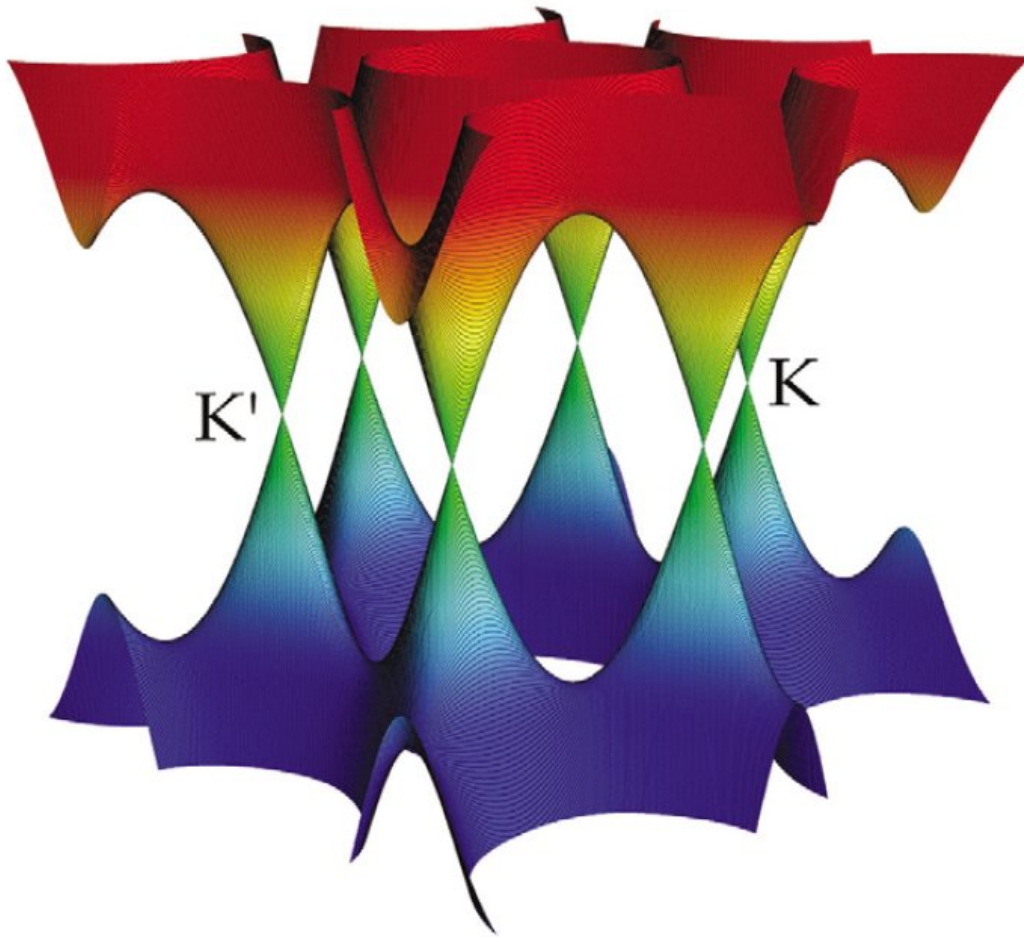


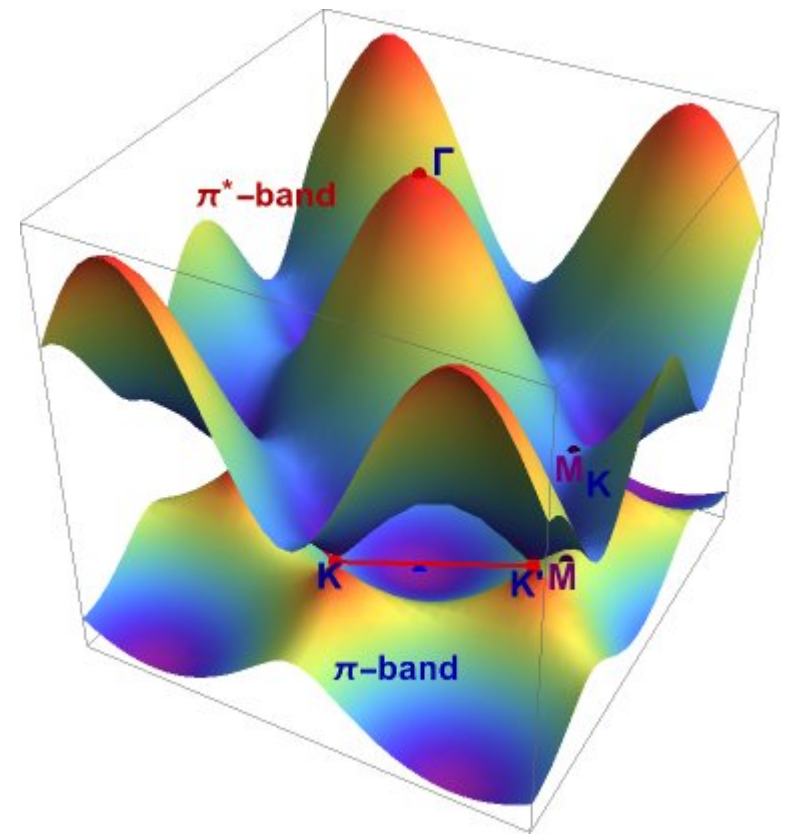
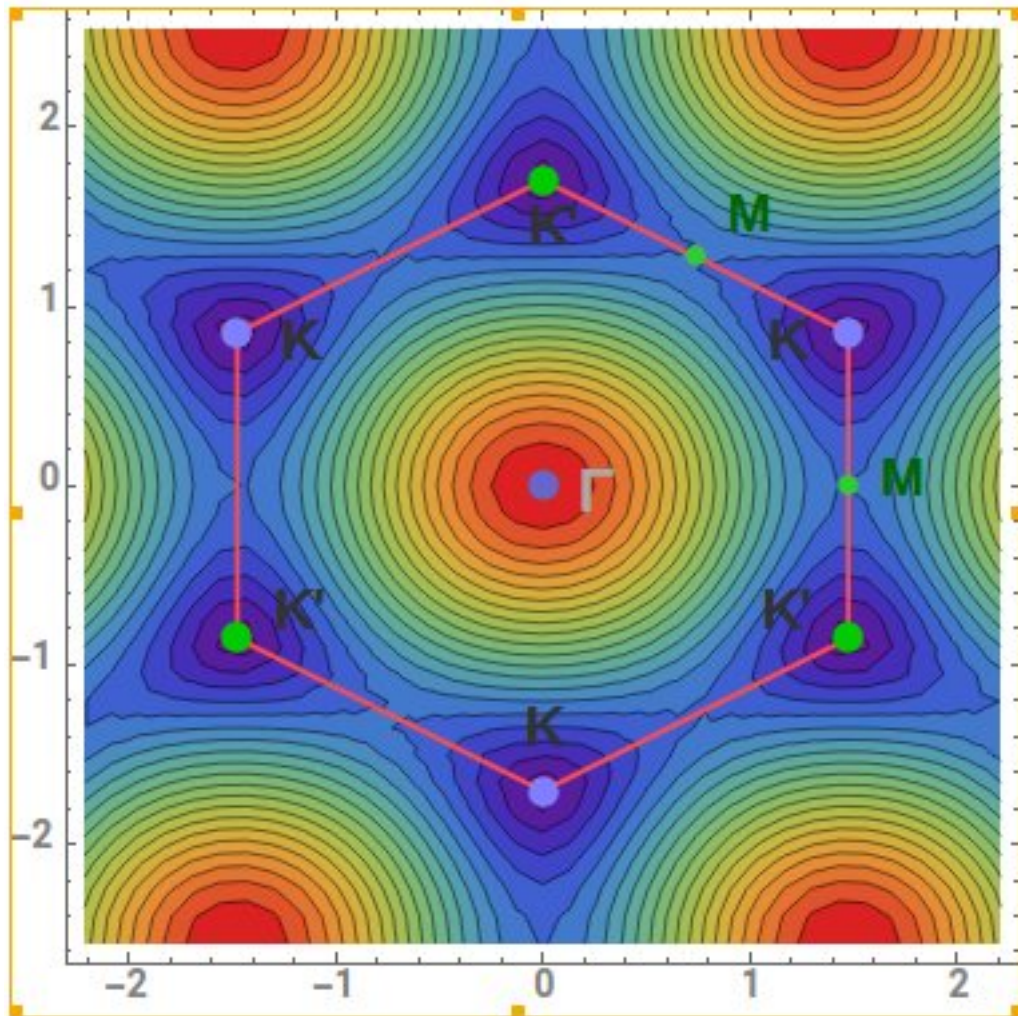
Group theory for structural analysis and lattice vibrations in phosphorene systems May 2015 Physical Review B 91(20)  
DOI: 10.1103/PhysRevB.91.205421



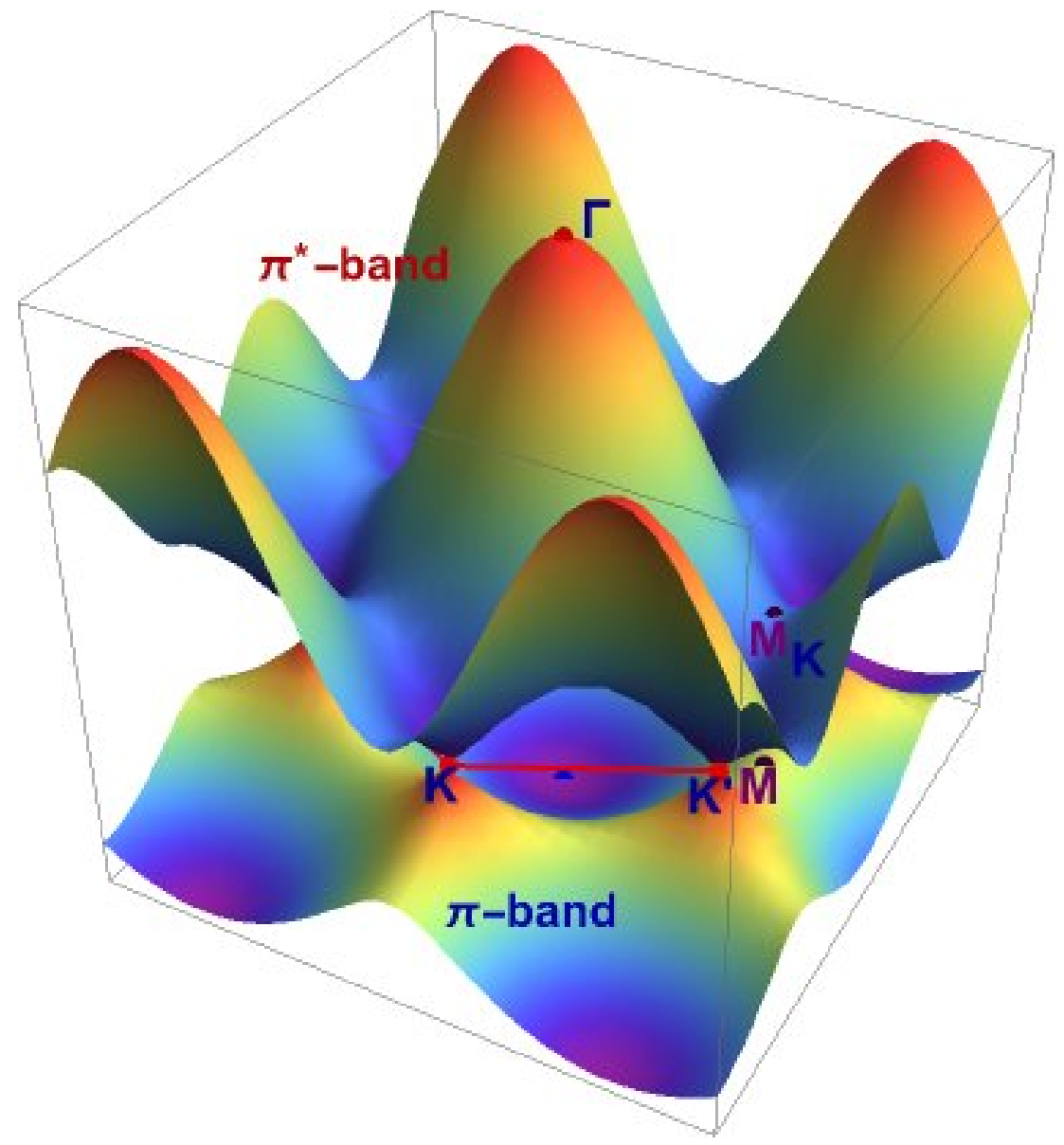
*Graphene example*

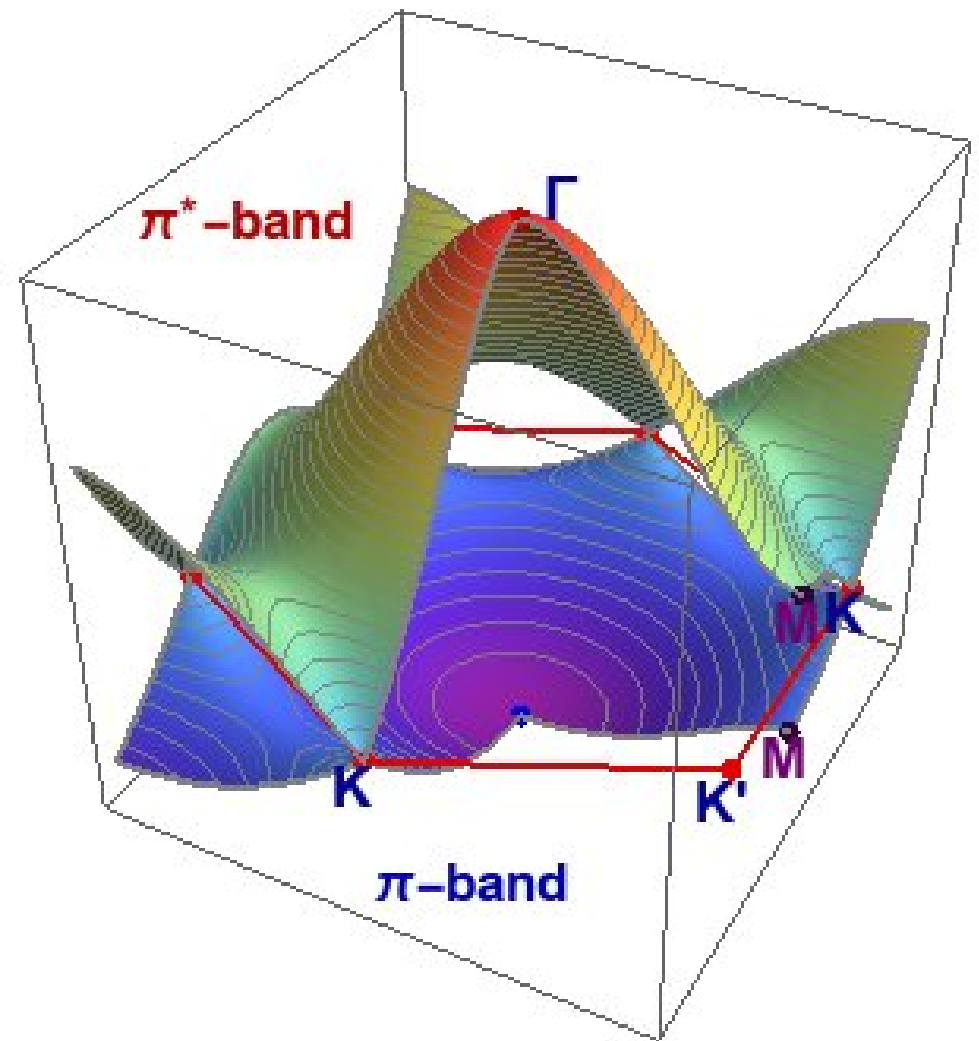
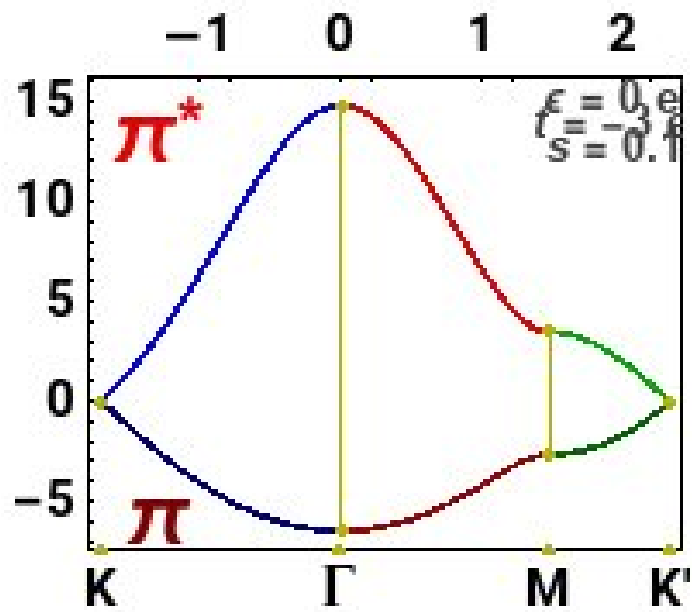






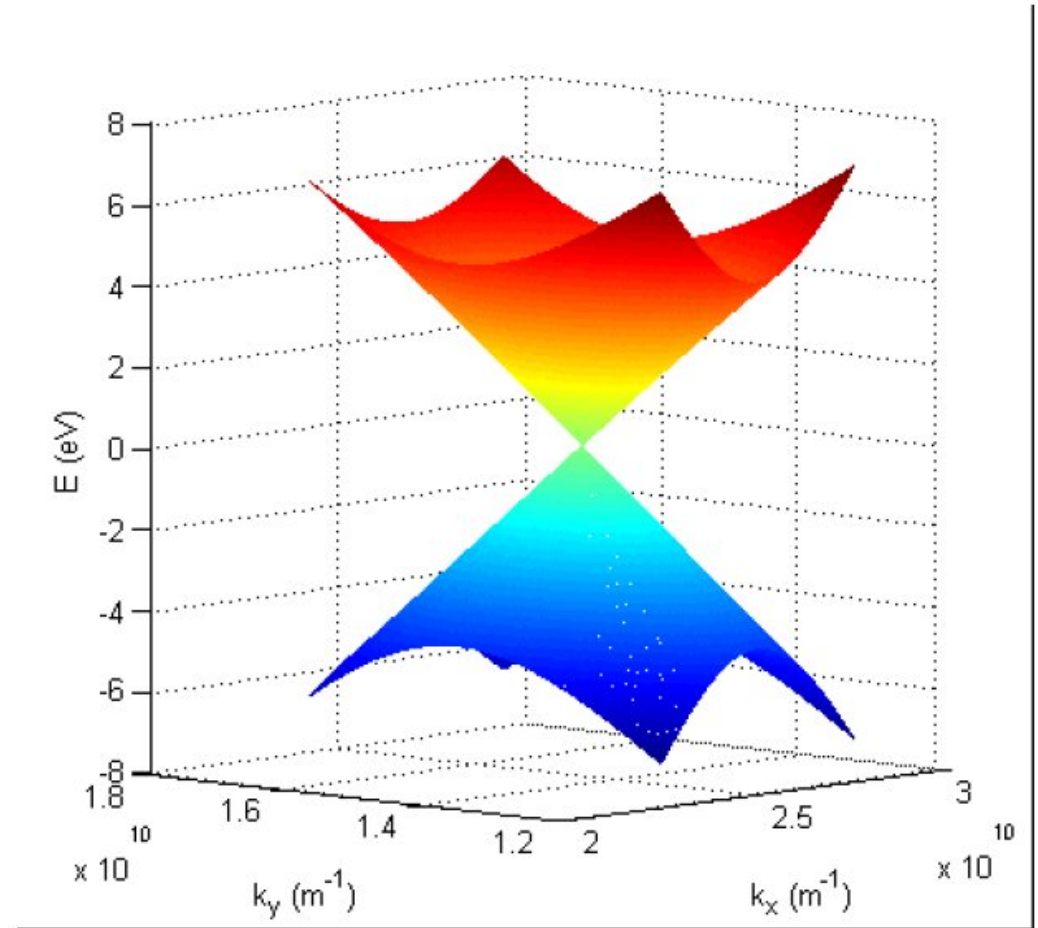
<https://demonstrations.wolfram.com/GrapheneBrillouinZoneAndElectronicEnergyDispersion/>

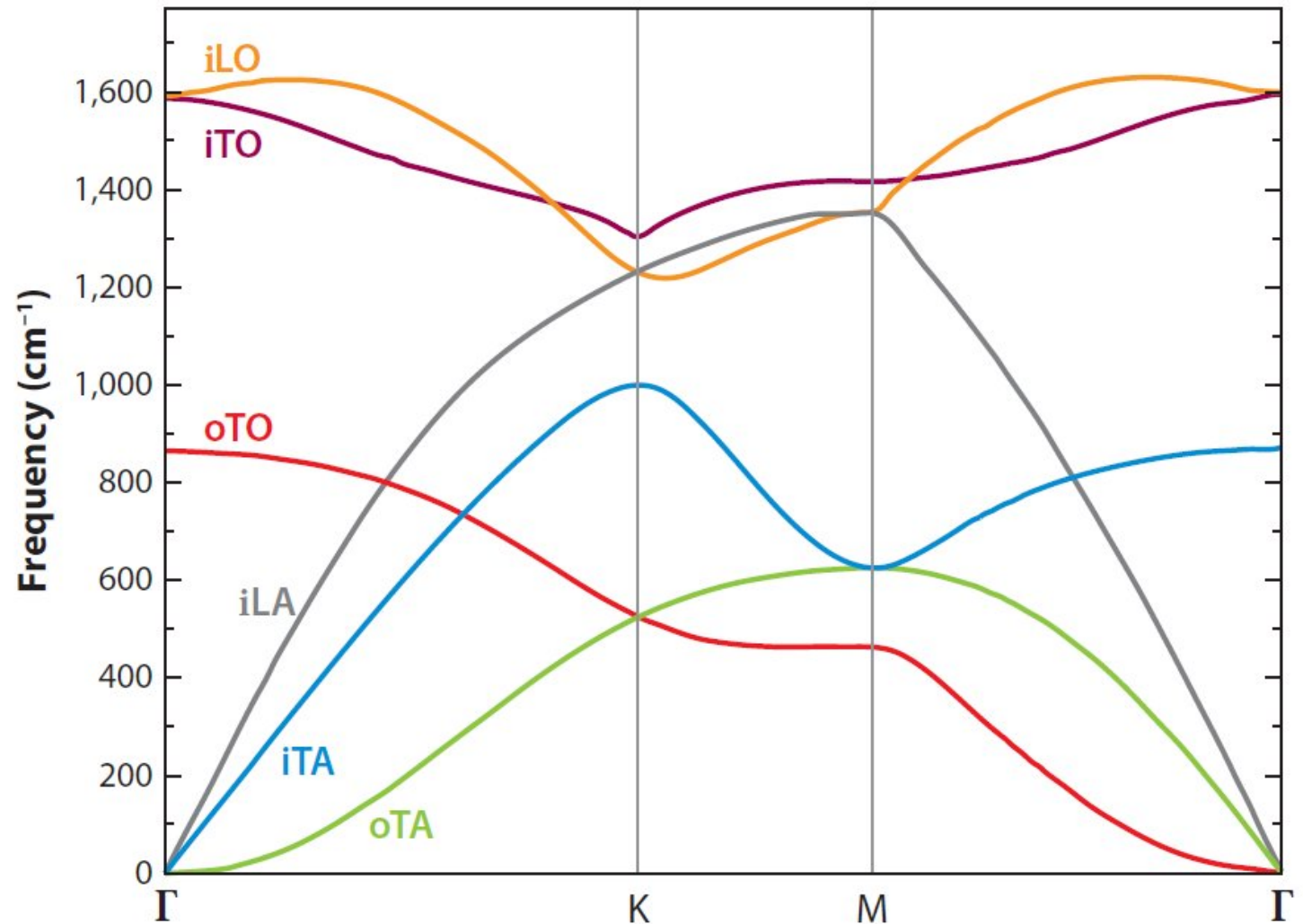




*Graphene near the bandgap:  
Linear bands  $\rightarrow$  no mass for  $e$  or  $h$*

*Far from the band (high energy carriers) the carriers have different properties*







- *J. C. Meyer, A. K. Geim, M. I. Katsnelson, K. S. Novoselov, T. J. Booth, and S. Roth, "The structure of suspended graphene sheets," Nature, vol. 446, no. 7131, pp. 60–63, Mar. 2007.*
- *E. H. Hwang, S. Adam, and S. Das Sarma, "Carrier Transport in Two-Dimensional Graphene Layers," Phys. Rev. Lett., vol. 98, no. 18, p. 186806, May 2007.*