Vibrational spectroscopy in nanostructures

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The research field of nano structures has boomed in recent years due to the increased demand from the portable electronic market, drug delivery, gas sensors, rechargeable batteries, among others.[1,2] One of the current techniques for the characterization of particles with dimensions in the nanoscale domain is Raman spectroscopy. A number of systems have been studied using this technique, such as carbon nanotubes and fullerenes. Analysis of the carbon nanotubes Raman spectrum allows determining the diameter of nanotubes, chirality and resonance conditions. Functionalization or chemical modifications are straightforwardly reveled using this spectroscopy. Alkali-metal dopants, for instance, leads to a shift of the Fermi level,[3-6] and to a conductivity enhancement of the SWCNTs.[7-10] Under pressure, the spectrum gives information on the state of deformation of the isolated tube or the bundle.[11-15]

The scope of this course is the study of carbon nanotubes physical and vibrarional properties. It will be organized as follows: 1) Background of basic definitions of lattice and other concepts needed to the understanding of the subject. 2) The structure of single-wall carbon nanotubes, SWNTs. 3) The electronic structure of grapheme and SWNTs. 4) The status of current research in the field of Raman spectroscopy of SWNTs. 5) A review of pressure effects in SWNTs: experiments and calculations.

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