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Infrared active vibrations in carbon nanotubes[1] KATALIN KAMARAS, ARON PEKKER, Research Institute for Solid State Physics and Optics, Hungarian Academy of Sciences, Budapest — The method of choice for the study of vibrational modes of carbon nanotubes has been almost exclusively Raman spectroscopy. Although calculations predict also infrared-active modes in nanotubes, so far only very few experimental results have been published. We conducted a systematic investigation of the infrared transmission of various types of single- and double-walled carbon nanotubes. Experiments were done on self-supporting transparent films in order to avoid perturbation from substrates. We find weak but reproducible vibrational peaks in the infrared spectrum. Their frequency scales with the diameter of the tubes, indicating their intrinsic character. Furthermore, on doping, some of the peaks change from Lorentzian to Fano-like character. This change can be explained by coupling of the tube vibrations to the conduction electrons introduced by doping. Finally, in double-walled nanotubes peaks typical of both outer and inner tubes can be distinguished. The vibrations of the inner tubes occur at the same frequency as those of single-walled tubes with the same diameter.

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