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Resonance Raman study of Polyynes encapsulated in single-wall Carbon Nanotubes with different diameters. L.G. MOURA, L.M. MALARD, Universidade Federal de Minas Gerais, D. NISHIDE, Nagoya University, Y. ACHIBA, Tokyo Metropolitan University, H. SHINOHARA, Nagoya University, M.A. PIMENTA, Universidade Federal de Minas Gerais — Polyynes are one of the simplest linear carbon chains and they have been recently encapsulated in single-wall carbon nanotubes. The stability of encapsulated polyynes opens a way to investigate experimentally these sp-hydrized carbon structures and to study of electronic correlation effects in 1D systems with potential applications in nanoelectronics. In this work we present a resonance Raman study of $C_{10}H_2$ and $C_{12}H_2$ polyynes inside single-wall carbon nanotubes with different diameters, using many different laser energies in visible range. We show that the observed optical resonance energies of the polyynes depends on the diameter of nanotubes, the maximum of the resonances decreasing with increasing diameter of the nanotubes. Moreover, the resonance energy is generally lower for $C_{12}H_2$ than $C_{10}H_2$. We have also observed a red-shift and strong changes in the shape of Raman G band of the metallic nanotubes when they encapsulate the polyynes, and these results were interpreted in terms charge transfer between these two systems and its effect on the electron-phonon coupling of the nanotubes. We have also observed that the interaction between polyynes and nanotubes is stronger for nanotubes with small diameters.

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