P-FKP21: Raman spectroscopy of single wall carbon nanotubes filled with semiconductors

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We investigated single wall carbon nanotubes filled with lead derived semiconductors: a wide-gap lead oxide, PbO, and three narrow-gap lead salts, PbS, PbSe and PbTe. It is concluded from the positions of the Raman lines that PbO crystalizes in the orthorombic phase inside the nanotubes. The line positions of the PbO lines are downshifted as compared to the bulk material as a result of the reduced dimensionality. As a consequence of the filling, nanotubes become sensitive to the laser irradiation. The lead salts crystallize in the rocksalt structure and thus have no Raman active modes. PbS itself is unstable under the laser irradiation and converts rapidly to PbO. The influence of the filling is derived from the changes of the nanotube Raman lines. Differences between a wide-gap and narrow-gap fillers are discussed.

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