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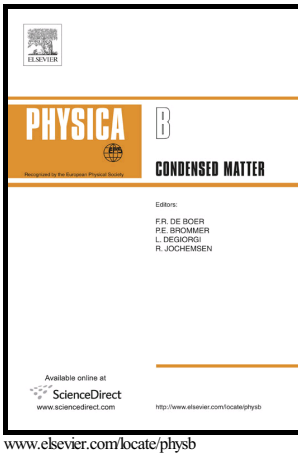

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Influence of uniaxial strain on the Linear optical spectra in the metallic single-walled carbon nanotubes

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Abstract

The linear absorption spectra of metallic zigzag single-walled carbon nanotubes (SWNTs) have been theoretically studied under the uniaxial strain by using the standard formulas of Orr and Ward. Due to the trigonal warping effect, the linear absorption spectra of M_{11} and M_{22} transitions are dominated by two major peaks, which come from the split M_{ii}^{-} and M_{ii}^{+} excitons with different band index q. As the uniaxial strain is applied, it is interesting to find that the split peaks will overlap at one point of the uniaxial strain, and the splitting is zero at this point. Hence, we can also describe this variation tendency as the size of splitting, which first decreases to be zero and then increases with increasing the uniaxial strain, based on which a supplemented tool is offered to detect the deformation degree of a metallic SWNT under uniaxial strain. In addition, the linear absorption spectra of the bands that nearest to the Fermi level have been also calculated, displaying an increase with the increase of the uniaxial strain, which can offer some useful information for the THz applications. The results obtained here are expected to be confirmed by the future experiment.

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Keywords: metallic carbon nanotube; absorption spectra; uniaxial strain

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