Influence of impurity on electronic properties of carbon nanotube superlattices

A A Shokri\textsuperscript{1,3} and Z Karimi\textsuperscript{2}

1. Department of Physics, Payame-Noor University (PNU), P. O. Box 19395-3697, Tehran, Iran
2. Physics Department, Islamic Azad University North Tehran Branch, Heravi Sq., Tehran, Iran
3. Computational Physical Science Research Laboratory, School of Nano-Science, Institute for Studies in Theoretical Physics and Mathematics (IPM), P. O. Box 19395-5531, Tehran, Iran
E-mail: aashokri@tpnu.ac.ir

(Received 28 October 2012  ;  in final form  22 May 2013)

Abstract
In this paper, electronic properties of single-wall armchair and zigzag carbon nanotubes (CNTs) superlattices, \( n(12,0)/m(6,6) \) and \( n(12,0)/m(11,0) \) are investigated. For this reason, the topological defects of pentagon–heptagon pairs at interfaces of carbon hexagonal network appear. These defects break the symmetry of the system, and then change the electrical properties. The calculations include two parts: investigation of the structures in the absence and presence of the impurity effect, which are calculated by the nearest-neighbor tight binding model. Our numerical results can be useful in designing nanoelectronic devices based on carbon nanotubes.

Keywords: carbon nanotube superlattices, tight-binding approximation, electronic band structure, topological defects, impurity effects.

For full article, refer to the Persian section