

Accepted Manuscript

Characteristics of classical Kirchhoff's superposition law in carbon atomic wires connected in parallel

Yan-Hong Zhou, Chang-Yong Chen, Bo-Lin Li, Ke-Qiu Chen



PII: S0008-6223(15)30181-0

DOI: [10.1016/j.carbon.2015.08.064](https://doi.org/10.1016/j.carbon.2015.08.064)

Reference: CARBON 10229

To appear in: *Carbon*

Received Date: 11 May 2015

Revised Date: 27 July 2015

Accepted Date: 20 August 2015

Please cite this article as: Y.-H. Zhou, C.-Y. Chen, B.-L. Li, K.-Q. Chen, Characteristics of classical Kirchhoff's superposition law in carbon atomic wires connected in parallel, *Carbon* (2015), doi: 10.1016/j.carbon.2015.08.064.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Characteristics of classical Kirchhoff's superposition law in carbon atomic wires connected in parallel

Yan-Hong Zhou^{1,2}, Chang-Yong Chen³, Bo-Lin Li¹, Ke-Qiu Chen^{1,*}

¹*Department of Applied Physics, School of Physics and Electronics, Hunan University, Changsha 410082, China*

²*Department of Information Engineering, Gannan Medical University, Ganzhou, Jiangxi 341000, China*

³*Department of Physics, Shaoguan University, Shaoguan 512005, China*

Abstract

The classical Kirchhoff's superposition law is hard to realize in the molecular scale devices because the coupling between the juxtaposed molecules can lead to constructive or destructive quantum interferences [Vazquez et al. *nature nanotechnology* 2012, 7, 663; Zhu et al. *Phys. Rev. B* 2014, 89, 085427]. In view of this, we try to eliminate the quantum interference between the juxtaposed molecules by increasing the distance between them. Simple junctions of carbon atomic wire(s) coupled to zigzag graphene nanoribbon electrodes are chosen as our model. Interestingly, fine Kirchhoff's superposition law phenomenon is found when the distance between the two carbon atomic wires reaches 15.5 Å. At the distance 15.5 Å, the conductance for the double carbon atomic wire (DCAW) configuration is 1.96 times of that for single carbon atomic wire (SCAW) configuration and the current across the DCAW configuration keeps nearly two times of that across the SCAW configuration at the applied biases. In addition, the conductance superposition effect becomes better when the distance between the two wires increases further and the spin filtering effect is enhanced in the DCAW configuration.

* Corresponding author. Tel: +86 0731-88823253. E-mail address: keqiu.chen@hnu.edu.cn (K. Q. Chen)

Download English Version:

<https://daneshyari.com/en/article/7851268>

Download Persian Version:

<https://daneshyari.com/article/7851268>

[Daneshyari.com](https://daneshyari.com)