Towards theoretical analysis of optoelectronic performance of uniform and random metallic nanowire layers

Mikita Marus, Aliaksandr Hubarevich, Hong Wang, Yauhen Mukha, Aliaksandr Smirnov, Hui Huang, Weijun Fan, Xiao Wei Sun

PII: S0040-6090(17)30101-3
DOI: doi: 10.1016/j.tsf.2017.02.012
Reference: TSF 35792

To appear in: *Thin Solid Films*

Received date: 18 May 2016
Revised date: 30 January 2017
Accepted date: 6 February 2017

Please cite this article as: Mikita Marus, Aliaksandr Hubarevich, Hong Wang, Yauhen Mukha, Aliaksandr Smirnov, Hui Huang, Weijun Fan, Xiao Wei Sun , Towards theoretical analysis of optoelectronic performance of uniform and random metallic nanowire layers. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Tsf(2017), doi: 10.1016/j.tsf.2017.02.012

Towards theoretical analysis of optoelectronic performance of uniform and random metallic nanowire layers

Mikita Marus[a], Aliaksandr Hubarevich[a], Hong Wang[a], Yauhen Mukha[b], Aliaksandr Smirnov[b], Hui Huang[c], Weijun Fan[a], Xiao Wei Sun[a,d,*]

[a]*School of Electrical and Electronic Engineering, Nanyang Technological University, 50 Nanyang Avenue, 639798, Singapore*
[b]*Department of Micro- and Nano-Electronics, Belarusian State University of Informatics and Radioelectronics, 6 P. Brovki, Minsk, 220013, Belarus*
[c]*Surface Technology Group, Singapore Institute of Manufacturing Technology, 71 Nanyang Drive, 638075, Singapore*
[d]*Department of Electrical and Electronic Engineering, College of Engineering, South University of Science and Technology, 1088 Xue-Yuan Road, Nanshan, Shenzhen, Guangdong, 518055, China*

Abstract

This work presents a theoretical analysis of optical and electronic properties of uniform and random silver (Ag) and aluminum (Al) nanowire (NW) layers. At low concentrations of NWs the uniform and random layers possess similar average transmittance in the visible spectrum. However, at high concentrations of NWs the random Ag and Al layers demonstrate up to 38% and 45% average transmittance, respectively. Moreover, at high concentrations of NWs the uniform and random Ag layers outperform identical Al layers up to 15% and 5% average transmittance, respectively. Our results indicate that metallic random NW transparent conductive layers benefit in optoelectronic devices demanding lowest sheet resistance, such as solar cells and light-emitting diodes.

*Corresponding author
Email address: sunxw@sustc.edu.cn (Xiao Wei Sun)