Conductivity of epitaxial and CVD graphene with correlated line defects - DTU Orbit
(18/03/2019)

Conductivity of epitaxial and CVD graphene with correlated line defects

Transport properties of single-layer graphene with correlated one-dimensional defects are studied theoretically using the computational model within the time-dependent real-space Kubo-Greenwood formalism. Such defects are present in epitaxial graphene, comprising atomic terraces and steps due to the substrate morphology, and in polycrystalline chemically vapor-deposited (CVD) graphene due to the grain boundaries, composed of a periodic array of dislocations, or quasi-periodic nanoripples originated from the metal substrate. The extended line defects are described by the long-range Lorentzian-type scattering potential. The dc conductivity is calculated numerically for different cases of distribution of line defects. This includes a random (uncorrelated) and a correlated distribution with a prevailing direction in the orientation of lines. The anisotropy of the conductivity along and across the line defects is revealed, which agrees with experimental measurements for epitaxial graphene grown on SiC. We performed a detailed study of the conductivity for different defect correlations, introducing the correlation angle $\alpha_{\text{max}}$, the maximum possible angle between any two lines. We find that for a given electron density, the relative enhancement of the conductivity for the case of fully correlated line defects in comparison to the case of uncorrelated ones is larger for a higher defect density. Finally, we, for the first time, study the conductivity of realistic samples where both extended line defects and point-like scatterers such as adatoms and charged impurities are presented.

General information
State: Published
Organisations: Department of Micro- and Nanotechnology, Theoretical Nanotechnology, Center for Nanostructured Graphene, G. V. Kurdyumov Institute for Metal Physics of NASU, Linköping University
Contributors: Radchenko, T. M., Shylau, A., Zozoulenko, I. V.
Number of pages: 7
Pages: 88-94
Publication date: 2014
Peer-reviewed: Yes

Publication information
Journal: Solid State Communications
Volume: 195
ISSN (Print): 0038-1098
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.47 SJR 0.535 SNIP 0.764
Web of Science (2017): Impact factor 1.549
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.42 SJR 0.519 SNIP 0.67
Web of Science (2016): Impact factor 1.554
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.7 SJR 0.718 SNIP 0.826
Web of Science (2015): Impact factor 1.458
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 1.79 SJR 0.859 SNIP 0.837
Web of Science (2014): Impact factor 1.897
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.63 SJR 0.806 SNIP 0.8
Web of Science (2013): Impact factor 1.698
ISI indexed (2013): ISI indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 1.68 SJR 0.994 SNIP 0.936
Web of Science (2012): Impact factor 1.534
ISI indexed (2012): ISI indexed yes