The Summer Undergraduate Research Fellowship (SURF) Symposium
4 August 2016
Purdue University, West Lafayette, Indiana, USA

Computer Modeling of Graphene Field Effect Transistors

Drew M. Ryan, Robert S. Bean
School of Nuclear Engineering, Purdue University

ABSTRACT

Graphene has been the centerpiece of numerous research projects since its discovery in 2004, greatly due to its multitude of unique properties. Its variable conductivity, relative strength, and electron mobility make graphene a prime candidate for applications in the field of radiation detection. While work has been performed in the past on testing radiation detection using graphene using Graphene Field Effect Transistors (GFET), due to its limited size, fabricating GFETs can be tedious and costly. Therefore, a need arose for a way to test potential GFET designs without the cost and limitations of fabricating GFETs for each test iteration. Using COMSOL Multiphysics, a model of graphene's material properties and a model of a GFET detector were created to simulate the electric responses. The COMSOL simulation in this project provided data on the responses from the detector, as well as potential scaling information for idealized monolayer single crystal graphene. The results from the computer model are promising; however, experimental work is needed to verify the data. While theoretical information is available on the response of the GFET detector, this data is from an idealized environment based on past empirical and theoretical work. Additional work will need to be performed in the future to compare these results to GFETs in realistic environments.

KEYWORDS

Graphene, COMSOL, GFET, Modeling