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Exploring the scaling of graphene for radiation detection

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Graphene as a radiation detection material is a burgeoning research field with much promise. There are still many questions left to address, however, and one is the scaling of graphene from micrometers dimensions up to millimeter dimensions. This is addressed by testing the electrical response of a graphene field effect transistor, at larger scales. The device architecture consisted of using chemical vapor deposition grown monolayer graphene, which had a manufactured grain width of up to 10 μm. The graphene field effect device consisted of ~525 μm n-type Silicon (1-10 Ohm-cm), 300 nm thermal oxide, and then the monolayer graphene. Four sizes of graphene, 3000 x 500 μm^2, 600 x 100 μm^2, 300 x 50μm^2, and 60 x 10 μm^2 were patterned onto the device. Each strip had four metal contacts, placed at various distances along the length of the graphene strip, and ending along the width's centerline. A two probe resistance measurement of each strip was conducted, as well as graphene resistance response for several back gate voltage sweeps. The results show the scalability of graphene field effect devices as the graphene dimensions are increased to larger sizes, offering insight into the potential of large scale graphene based radiation detectors.

Biography

Zachary Shollar is currently pursuing his Master of Science in Nuclear Engineering at Purdue University. During his employment as a Research Assistant under Dr. Robert Bean, he has worked towards understanding graphene and its application in radiation detection. Upon graduation, he plans to take the experience gained and work in a capacity to solve problems involving radiation detection, nuclear security and nuclear forensics.

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