Area-Selective Growth of Metal Oxides on Graphene Flakes

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Scalable fabrication of next generation electronics will require the precise control of matter at the nanoscale. We investigated area selective growth of metal oxide layers on graphene flakes. This was accomplished with an experimental study of defect engineering on graphene flakes to examine the effect of electron beam functionalization on the growth of metal oxide films on graphene flakes. Suitable graphene flakes are identified using optical microscopy and Raman spectroscopy. These flakes are functionalized in selected areas with an electron beam controlled by an electron microscope. Atomic layer deposition is performed on the samples to grow metal oxide films on the functionalized areas. Atomic force microscopy and energy dispersive x-ray spectroscopy data is collected to characterize the growth in functionalized zones compared to outside areas. By comparing height data from atomic force microscopy across functionalized and non-functionalized areas, we have found that we can control the area in which metal oxide layers grow on flakes of graphene.