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Probing Charge Migration in Progressively Reduced Graphene Oxide using Electrostatic Force Microscopy SIBEL EBRU YALCIN, Los Alamos National Laboratory, CHARUDATTA GALANDE, Rice University, HISATO YAMAGUCHI, GAUTAM GUPTA, Los Alamos National Laboratory, PULICKEL AJAYAN, Rice University, ANDREW DATTELBAUM, STEPHEN DOORN, ADITYA MOHITE, Los Alamos National Laboratory — The discovery of graphene and tremendous attention it took in the last few years led to the discovery of graphene oxide (GO) for the large scale production of graphene. GO provides an ideal platform to manipulate and control its chemical structure, optoelectronic properties and ionic conductivity for a wide range of applications. Therefore, it is critical to understand the physical and electrical properties of GO that are highly dependent on the density and nature of functional groups. Here, using electrostatic force microscopy (EFM), we inject charge and directly probe the charge migration as the GO is progressively reduced (RGO). EFM results on GO flakes indicate that the injected charge is completely localized within the plane of GO. However, with the increasing degree of reduction, the injected charge rapidly delocalizes over a few microns until it ends up at the edge of the flakes. The results suggest that as we go from GO to RGO, there are more percolating pathways of sp2 that are formed that act as conduits for charge migration. Our results are consistent with the observed photoluminescence quenching on GO flakes measured as a function of reduction from GO to RGO.

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