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Two-dimensional metal-insulator transition in functionalized graphene MICHAEL OSOFSKY, SANDRA HERNÁNDEZ, Naval Research Lab, ANINDYA NATH, George Mason University, VIRGINIA WHEELER, SCOTT WALTON, CLIFFORD KROWNE, KURT GASKILL, Naval Research Lab — Since its discovery, graphene has held great promise as a metal with massless carriers and thus extremely high mobility. This feature is the result of the two-dimensional character of the band structure due to the so-called Dirac cone for the ideal, perfectly ordered crystal structure. One of the implications of this ideal case is that the transport properties of this material should be immune to lattice disorder. In reality graphene, which is subject to varying amounts of disorder that depends on preparation method, environment, impurities and other extrinsic variables, has been shown to exhibit an effective mass. Thus, metallic behavior with a wide range of mobilities has been reported. This situation contradicts the prediction that all two-dimensional systems must be insulating. Furthermore, there have also been reports of damaging graphene so severely that it becomes an insulator. Therefore, graphene, with its single layer structure, is a model system for studying the two-dimensional metal-insulator transition (MIT). In this work, we systematically increase the resistivity of epitaxial graphene via the introduction of chemical moieties using very low temperature plasmas. These results reveal the existence of a two dimensional MIT in epitaxial graphene.

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