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(G*) Negative Differential Resistance in Carbon-based Cryogenic Composite Nanomaterials

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With the proliferating global concern for environmental issues, there is a growing demand for a renewable, cost-effective, and sustainable electronics [1]. Carbon-based composite nanomaterials (i.e. graphene, graphene oxide, carbon nanotubes, carbon quantum dots etc.) are a promising candidate for such applications due to their tunable electrical, optical, and mechanical properties [2]. Most importantly, carbon materials are generally lacking in toxicity making them highly ecofriendly. Graphene oxide (GO) is a two dimensional oxidized form of graphene with oxygen functional groups decorated within the sp2 basal carbon plane [3]. The physical properties of GO can be tuned with simple wet chemistry by the adjustment of surface functional groups and can be easily extend to large scale production making it an attractive material for studies in device fabrication, renewable energy, and medicine [4]. In this presentation, we present the study of multilayer GO composite of polyvinylidene fluoride (PVDF) : D-glucose synthesized by lyophilisation i.e. freeze drying. Preliminary studies of our GO composite material include scanning electron microscopy (SEM), energy dispersive x-ray spectroscopy (EDX) and current-voltage characteristic measurements. From preliminary studies, our GO composite material shows a negative differential resistance in which the carrier transport mechanism can be associated with quantum mechanical tunneling.

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