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053013

### **Dissertation Abstract**

Graphene is a two-dimensional  $sp^2$ -hybridized carbon-based material possessing extraordinary properties including, excellent electrical conductivity, ballistic thermal conductivity, tensile strength exceeding that of steel, high flexural strength, optical transparency, and the ability to adsorb and desorb atoms and molecules. Because of these characteristics, graphene is a candidate for applications in integrated circuits, electrochromic devices, transparent conducting electrodes, desalination, solar cells, thermal management materials, polymer nanocomposites, and biosensors. Despite the above mentioned properties and possible applications, very few technologies have been commercialized with graphene. This is due to the high cost associated with the raw materials and complicated processes required in graphene's fabrication. In an effort to contribute to the commercialization of graphene on a large scale, the dissertation research proposed here will include a low-cost synthetic process of graphene from humic acid which is obtained from an inexpensive source of carbon. It has been suggested in current literature that graphene can be derived from functionalized graphene via microbial reduction of graphene oxide. This process utilizes specific bacteria which have the ability to use both organic and inorganic compounds as terminal electron acceptors in their respiratory pathway. Due to the data found within the literature, it is hypothesized that these bacteria may also reduce humic acid to graphene using low-cost and non-toxic starting materials and energy efficient processes. The dissertation work will include the validation and characterization of the physical and electrical properties of the humic acid starting material versus graphene oxide and the identification of the facultative aerobic/anaerobic bacteria that are capable of reduction to graphene.

Amber Douglas – Bio

Education

Graduated from St. Edward's University (Austin, TX) – 2003, B.S. Chemistry

Graduated from Texas State University-San Marcos – 2007, M.S. Chemistry

Industry

Worldwide Clinical Trials, 2007-2011, Project Manager and Laboratory Manager

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