Material Platform for the Manufacturing of Multifunctional Graphene Sheets

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Abstract

Graphene, in its one atom thick carbon sheet form, is a special 2 dimensional nanomaterial that bridges the chemical and physical worlds. On the one hand, graphene can be seen as a chemical, a gigantic two-dimensional monomer, allowing organic chemistry to investigate its use as a reactive platform and composite and polymer science to investigate its functionalized forms into dispersed, percolated or continuous architectures, ranging from randomly to highly organized structures. On the other hand, its intrinsic physical properties span from high electron mobility, exceptional mechanical strength to high surface area among others. All these variations can provide novel opportunities for designing new devices or materials with enhanced properties in electronics, spintronics, thermal management, energy generation and storage, composite material, biotechnology, etc. [1,2]

Many manufacturing routes of graphene or graphene-like and/or nanocarbon materials have been published in the recent years. With each manufacturing process leading to a particular carbon-based nanomaterial one can see a growing availability of nanocarbon materials that can potentially provide unique benefits in selected applications. CVD Equipment Corporation has recently developed a novel and flexible Nano*to*Marco™ manufacturing process that allows us to transform graphene or graphene-like nano-powders into macroscopic forms. More specifically we can transform them into flexible sheets with controlled electrical and/or thermal conductivity, mechanical strength, porosity, thickness, anisotropic behavior, etc. This allow us to optimize their value proposition for a given target application. We believe this approach ensures an easy and safe handling of these nanomaterials while providing more value added opportunities for them.

In this paper we present the first series of measurement performed on a variety of graphene-like powdery starting materials transformed into a sheet format with our proprietary Nano*to*Marco™ manufacturing process. In particular we will focus on the electrical and electrochemical properties of the resulting composite papers.

References

[1] Z. Sun , D. K. James , J. M. Tour, *J. Phys. Chem. Lett.* 2 (2011), 2425-2432.
[2] W. Wei, X.Qu, *Small* 8 (2012), 2138-2151.

Figures

Fig.1. *two samples of paper-like nanocarbon sheet created through our* Nano*to*Marco™ manufacturing process. *Final properties depend on the type of nanocarbons used as raw materials and on the chosen manufacturing process steps (measuring tape in inches).*