Industrial Applications for Micromechanical Exfoliated Graphene

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Graphene industry will be about 133.77 million € by 2020, and up to 440 million € by 2024. However, to reach these estimations it is necessary to face the challenges existing today for the commercialization of graphene: to produce high quality material on a large scale at low cost, and in a reproducible manner. In this context GrapheneTech-EEA is working in the industrialization of an environmental-friendly technology that enables a large-scale production of high quality graphene nanoplatelets.
The main objective is to go from a small-scale prototype (20kg/day) to a large-scale production in 2022 of 300T/year by means of the implementation of an innovative own technology based on the dry-micromechanical exfoliation process. Nowadays micromechanical exfoliation is done in wet conditions involving the use of toxic chemical and hazardous waste. EEA has overcome this risk through the proper control of thermodynamic conditions of graphite exfoliation in a dry environment.
The synthesis and the application of graphene for the polymer sector, conductive inks, grease and oils mentioning the level of progress achieved in Graphene-Tech. Regarding the characteristics of the graphene material, the addition of single-layer graphene powder to polymeric matrixes at large scale is still far due to its extremely low density that results in important technical difficulties concerning its dosage in extrusion/injection systems and especially, its elevated economical costs. For these reasons, nowadays, graphene nanoplatelets (as our GPx products) represent the most suitable and promising solution. Then, the incorporation of graphene into different matrix is challenged by some parameters as the dispersion. In order to enhance the properties of the composite is strongly required to have a homogeneous material uniformly dispersed. Our R&D department (in collaboration with other companies) develops tailored made dispersions, in polymeric matrix by either in situ polymerization or addition of the GPx products to preexisting polymers:

- We have produced polyurethane (PU)/graphene foams with different cell sizes and graphene loads that exhibit enhanced heat dissipation and thermal properties. This type of nanocomposite will be incorporated in high-tech mattress.
- We have carried out the dispersion of our graphene into thermoplastic polymers, such as high density polyethylene (HDPE), polystyrene (PS) and polypropylene (PP), improving their mechanical properties with low proportions of graphene. These achievements allow the partial substitution of the pristine polymers.
- We are working in collaboration with 3R3D Technology Materials S.L to develop a conductive graphene filament specifically designed for 3D printing of electrically conductive components.

Figures

Figure 1: Left: PLA Conductive Right: PU Foam