

Integration of graphene into polymers

Susana Otero Belmar

AIMPLAS, Plastic Technology Centre, Gustave Eiffel, 4, 46980, Paterna

sotero@aimplas.es

Abstract

Since the discovery of the graphene synthesis in 2004 by Andre Greim and Konstantin Novoselov, numerous researches are being globally performed in order to speed up the arrival of a highly promising material to the industry.

Graphene-polymer nanocomposites

However, graphene cannot be considered as a simple filler or additive that can be easily incorporated into any development or application. The reasons are diverse:

- 1) Difficulty and safety of processing and handling;**
- 2) Graphene compatibility with other materials;**
- 3) Formation of aggregates and several micron agglomerates;**

The integration of graphene into polymers as a carrier material is highlighting as the most suitable technical solution to integrate graphene into product, since concentrates or masterbatches ease its handling and processing in an industrial environment; likewise, the integration through polymer may be the most suitable way to find the compatibility between different materials by performing the polymer as a carrier. On the other hand, nanocomposites based on graphene and carbonaceous nanostructures at very low temperature show substantial improvements in its multifunctional aspects compared with conventional resins and other materials. This not only enables to obtain a lightweight

material, but also makes it stronger for many multifunctional applications.

Figures



Figure 1: Graphene aerogel. AIMPLAS.

The remarkable properties of GRMs improve the physical-chemical characteristics of the polymeric matrix after its distribution/dispersion. This facilitates the strengthening and the increase of the interfacial bonds between the layers of the graphene and carbonaceous nanostructures with the base matrix. This bond determinates the appearance of cumulative properties of GRMs in strengthened nanocomposites.

Graphene-based nanocomposites show thermal, electrical, flame retardant, anti-corrosive, gas barrier properties and superior mechanical properties in comparison with pure polymers.

Graphene integration into plastic materials in Spain

The project GRAPHOS, funded by CDTI CIEN program, is led by the company of chemical specialties CROMOGENIA and has the participation of ANTEX, ARZUBIALDE, BECSA, ELIX POLYMERS, MAIER, NANOINNOVA and POLYMEC. It kicks off with the ambitious aim of achieving the incorporation of graphene and carbonaceous nanostructures in a broad range of polymeric matrixes.