

# Bulk graphene materials production and application in composites, energy and coatings

**Julio Gomez(a)**

Javier Perez(a); Elvira Villaro(b)  
AVANZARE, Avda Lentiscars 4-6, Navarrete,  
Spain  
(b)INTERQUIMICA. San Francisco 11, Navarrete,  
Spain  
[julio@avanzare.es](mailto:julio@avanzare.es)

## Abstract

The bulk graphene market will exponentially grow in the next few years. Its applications in composites will be the largest segment, followed by energy storage applications.[1] Several reviews analysed the applications of the different graphene and related products in energy [4, 1b] and in composites applications.[5, 1b]

In this presentation, 4 different methods for the production of bulk graphene or reduce graphene oxide: liquid phase exfoliation, electrochemical, rGO and ultraexpansion were compared with other production methods and products in the market. The complete characterization of graphene and highly reduce graphene oxide will be presented.

Different types of graphene materials with variation in lateral size, defects and defects concentration, thickness, etc, have been used to obtain graphene composites. The different effects of the incorporation of the graphene materials on electrical, thermal conductivity and fire retardant properties of epoxy were investigated.

Related to electrical properties, some of these composites show lower percolation threshold limits than the previously reported values, also obtaining ultralow percolation limits, opening a new range of applications and markets. [figure 1]

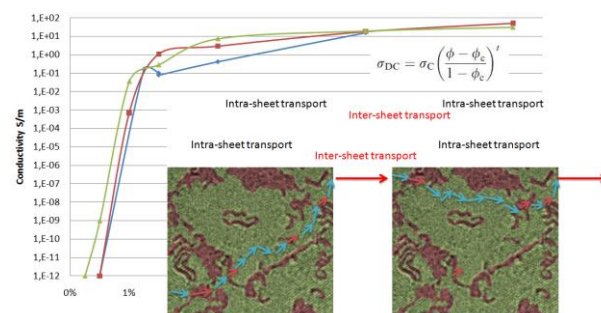
Other factors as processing technique, the compatibility between graphene and matrix and dispersion have an extremely high importance in the results.

The use of different graphene materials and decorated graphene materials in energy applications, from anodes and cathodes of batteries to supercapacitors with ultrahigh energy density, will be also presented.

## References

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## Figures



**Figure 1:** Electric percolation and Scheme of the transport in a composite.