

Graphene-based materials for large-scale applications: ideal graphene vs. real commercial products

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Bulk composites are currently the most common, commercially available applications of graphene and related materials (GRM). The number of products containing these composites is increasing continuously, from tennis rackets to bicycles to skis. However, the lack of a clear metrology and of quality control for graphene is creating confusion among industrial end-users, [1,2] with some companies advertising as "graphene" what instead is graphite powders, platelets or other carbon materials. Whilst nomenclature[3] and a classification framework[4] have been proposed for 2D graphene-based materials, a clear agreement on international standards is still missing.

A high number of graphene producers worldwide s GRM with a very broad range of morphology and quality. It is thus difficult to evaluate correctly if the new materials continuously introduced on the market are truly competitive with commercially available ones, either in performance or in production cost.

To develop innovative and industrially relevant applications of GRM it is fundamental to have a realistic evaluation of the state-of-the-art of existing commercialized products. To this aim, here we describe a procedure to benchmark GRM materials available as commercial

products from industrial producers worldwide.

References

- [1] Palermo et al. *Advanced Materials*, 28 (2016) 6232.
- [2] Samori et al. *2d Materials*, 2 (2015) 030205
- [3] Bianco et al. *Carbon*, 65 (2013) 1
- [4] Wick et al. *Angewandte Chemie International Edition*, 53 (2014) –7714.

Figures

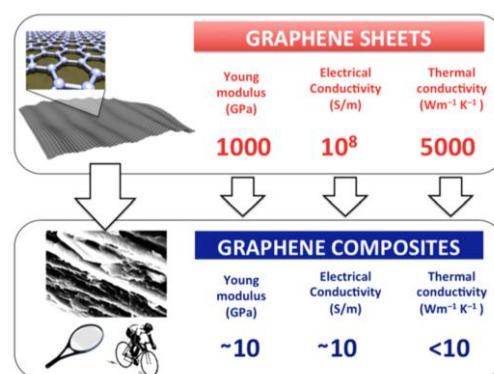


Figure 1: Schematic representation of the difference in performance between single, 'ideal' graphene sheets and graphene-based macroscopic composites suitable for commercial applications. From ref. [1]