

## IDEALLY DISPERSED MULTI-WALL CARBON NANOTUBES FOR ELECTROSTATIC DISCHARGE PROTECTION

### GENERAL INFORMATION

#### Introduction:

Added in thermoplastics, Graphistrength<sup>®</sup> multi-wall carbon nanotubes (MWNT) bring numerous benefits to applications that require precisely controlling the electrical conductivity while optimally retaining the mechanical and physical properties of the matrix.

However, desired properties are achieved only if the proper degree of MWNT dispersion is ensured. In order to help its customers and ensure consistent performances, Arkema performs the initial dispersion of MWNT in various thermoplastic matrices. These Graphistrength<sup>®</sup> Masterbatches can be easily diluted to the final concentration without any MWNT re-agglomeration.

#### Masterbatch description:

All of Graphistrength<sup>®</sup> Masterbatches contain perfectly dispersed MWNT at a typical concentration of 20% by weight. Graphistrength<sup>®</sup> Masterbatches are manufactured under specific mixing and dispersion conditions that don't alter the original features of MWNT.

Graphistrength<sup>®</sup> Masterbatches are now available in various polyamide matrix polymers.

Other Masterbatches are also developed in the Arkema's facilities. For other matrices under your consideration, contact us to get more information.

#### Masterbatch dilution:

The dilution of Graphistrength<sup>®</sup> Masterbatches into high quality compounds can be achieved with standard equipments used in thermoplastics compounding such as twin-screw extruders. In some cases, optimizing process conditions may be necessary to get well-dispersed compounds. More information is provided in our *Dilution Guide of Graphistrength<sup>®</sup> Thermoplastic Masterbatches*.

Generally, typical final MWNT loadings in compounds are in the range 1 to 5 wt% depending on the matrix and the targeted performances.

#### Benefits:

Compounds prepared from Graphistrength<sup>®</sup> Masterbatches may have various levels of electrical conductivity depending on MWNT loading, processing methods and conditions.

In the range of electrostatic discharge (ESD) protection, values may be easily adjusted from more than  $1 \times 10^8 \Omega \cdot \text{cm}$  (antistatic properties) up to below  $1 \times 10^2 \Omega \cdot \text{cm}$  (electromagnetic interference/radiofrequency interference shielding properties). The ESD properties obtained with Graphistrength<sup>®</sup> Masterbatches are outstandingly consistent and uniform.

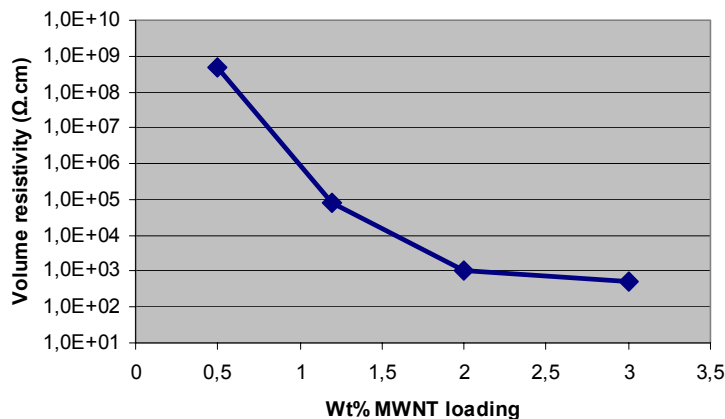
Thanks to their low loading, and very small size, Graphistrength<sup>®</sup> MWNT offer several additional advantages: smooth surface aspect, low increase in density and, high preservation of the neat matrix's ductility and mechanical properties. With low particulate generation, Graphistrength<sup>®</sup> MWNT are also ideal fillers for applications where cleanliness is key.

## Applications:

Graphistrength® Masterbatches are particularly suited to applications where stringent requirements, in terms of cleanliness, permanent electrostatic dissipation, and perfect surface finish, are in place, such as:

- Electronics (semi-conductors and ESD-sensitive components handling, housings of electronic devices)
- Industrial packaging
- Automotive applications (fuel systems)
- Plastic panels destined to electrostatic painting without using a conductive primer

## Typical percolation curve:



Example of percolation curve <sup>(1)</sup> for PA 12 - Dilution is performed by twin-screw extrusion of Graphistrength® C M1-20 into neat PA12

<sup>(1)</sup> The curve is intended solely for indicating potential performance that can be achieved with Graphistrength® C M1-20 but it doesn't replace the reader's own evaluations and experimentation

## Health and Safety:

Graphistrength® Masterbatches are provided in pellet form where MWNT are strongly embedded. Graphistrength® Masterbatches don't present any specific health risk when using in thermoplastic processing. For more information, please refer to the Material Safety Data Sheets.

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