

## CARBON NANOTUBES (CNT) MASTERBATCH for SILICONE RUBBER FORMULATIONS

### TECHNICAL DATA SHEET

#### Description:

Graphistrength® C E3-35 is a CNT masterbatch for Silicone rubber formulations that contains perfectly dispersed MWNT at a concentration of 35% by weight.

Graphistrength® C E3-35 is suited for the production of conductive or antistatic materials based on HCR, LCR silicone rubber formulation.

#### Key features:

Graphistrength® C E3-35 is provided in pellet form with the following key characteristics.

Property	Method	Unit	Typical value <sup>(1)</sup>
MWNT content		wt%	35 <sup>(2)</sup>
Moisture content	Karl-Fisher	wt%	0.05 -0.10
Bulk density	ISO 8130-2	g/cm <sup>3</sup>	1,223
Apparent density	ASTM D1895	g/cm <sup>3</sup>	1,03
Mooney viscosity (ML1+4, 100°C)	ASTM D1646		75

<sup>(1)</sup> Data not intended for specification purposes

<sup>(2)</sup> Graphistrength® C E3-35 contains Graphistrength® C100 MWNT with purity > 90 %

#### Benefits and applications:

Graphistrength® C E3-35 is generally compatible with most silicone resins. Typical MWNT loadings in the final compounds are in the range of 1,5 to 20 wt% depending on targeted performances.

The typical electrical resistivity that can be achieved is in the range of 10 – 10<sup>10</sup> ohm·cm depending on the host matrix characteristics, processing methods and conditions. The electrical properties obtained with Graphistrength® C E3-35 are outstandingly consistent and uniform.

Thanks to their unique morphology, Graphistrength® MWNT offers several additional advantages like smooth surface aspect and high preservation of the neat matrix's ductility (full performance obtained even at low loadings).

Graphistrength® C E3-35 offers high formulation flexibility thanks to high concentration of CNT in the masterbatch. Additionally, this masterbatch can be used with common mixing equipment.

**Dilution and processing:** The conditions of use of Graphistrength® C E3-35 depends on the process technology.

**For extrusion application** (sheet extrusion, wire and cable, casting on textile and other substrates, etc.)

The presence of CNT may bring an increase in viscosity of the final rubber formulation. This increase should not impact extrusion/casting process conditions nor the adhesion of the rubber to the substrate. If the viscosity factor happened to be critical, the use of lower viscosity base resin is recommended.

**For molding (HCR) applications** (rings, seals, gloves, tires, different flexible parts etc) the masterbatch can be introduced into the final formulation by using a cylinder, internal, conical mixer or any other conventional mixing equipment.

- The silicone base resin used in the masterbatch (65% in weight) must be taken into account to determine the correct amount of vulcanization/accelerator parts in the final formulation. This masterbatch carrier resin is a reactive in the vulcanization process.
- Carbon nanotubes may slightly reduce the vulcanization activity. Therefore it is recommended to increase the amount of vulcanization agent by 10%.
- The most efficient way to get an homogeneous rubber formulation is to firstly mix Graphistrength® C E3-35 with approximately half of silicone base rubber and all vulcanization agents (peroxide masterbatch for example). When the mixture looks homogeneous, the last part of the rubber can be introduced. The formulation is then ready for molding. This recommendation also allows the enhancement of the material electrical properties.
- The rubber material made with Graphistrength® C E3-35, becomes electrically conductive after vulcanization. Note that there is no relationship between the resistivity level of the formulation before and after vulcanization (therefore, the electrical properties should be tested on finished vulcanized article).

### **For injection molding (LCR) applications**

Graphistrength® C E3-35 can be diluted in the liquid silicone oil used in LCR kits. The base resin of the masterbatch is reactive to Pt-based curing agents; the silicon base used in C E3-35 (65% wt) has to be taken into account in the final formulation. In order to introduce the masterbatch in the liquid silicone formulation, immerse the needed quantity of the masterbatch pellets in one of the liquid component for at least 12 hours. Use common mixing tools to get final homogeneous dispersion.

### **Safety and Handling:**

Graphistrength® C E3-35 is provided in pellet form where MWNT are strongly embedded.

Graphistrength® C E3-35 doesn't present any specific health risk when using in rubber processing.

Graphistrength® C E3-35 is provided in 5 or 25 kg bags as pellets. The product is stable in its unopened original packaging when stored at normal temperatures.

**Consult the product SDS for additional information on properties, hazards and handling.**

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