Up-scaling of high conductivity graphene nanoplatelets and its integration in thermal interface materials

Izaskun Bustero[a]
I. Obieta[a], L. Bilbao[a], R. Rodriguez[a], B. Perez[a], P. Ladislaus[b], D. Presvytis[b], A. Goodwin[b]

(a) Tecnalia, División de Industria y Transporte, Mikeletegi Pasealekua, 2. Donostia-San Sebastián, Spain
(b) Thomas Swan & Co. Ltd., Rotary Way, Consett, County Durham, DH8 7ND, United Kingdom.

Izaskun.bustero@tecnalia.com

Abstract

As a result of participating in the H2020 INSPIRED Project, Thomas Swan has developed a novel scalable method for exfoliating graphite in liquids to give large-volume dispersions of graphene nanoplatelets. The product is a pristine, high conductivity graphene nanoplatelet material which is available in both powder format and as a surfactant stabilised aqueous dispersion (Elicarb® Graphene).

Several graphene dispersions have been studied in terms of stability by zeta potential measurements. The Results are consistent with a relatively stable dispersion when unwashed (zeta potential magnitude > 30 mV. Their rheological behaviour is shown on figure 2.

Structural characterization of Elicarb® graphene by SEM is shown in figure 1. Ratio of Raman D/G peaks (measure of graphene quality): D/G < 0.5. The ratio is consistent with small, defect free flakes. Number of layers < 10 for "Premium Grades"

Thermal Conductivity of graphene nanocomposites (TIMs): at 7% loading in a resin, the GNPs typically double the thermal conductivity and are easily dispersed.

References

[1] Paton K R et al, Nature Materials, 13 (2014) 224
[2] KMF Shahil, AA Balandin , Nano Lett. 12 (2012) 861

Figures

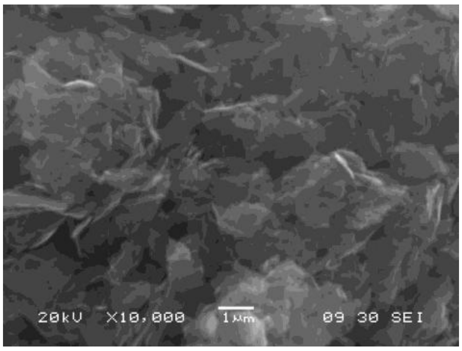

Figure 1: Elicarb® Premium Grade
Typically ca.1 μm D/G 0.2-0.3
Sheet resistance <10 Ω/□

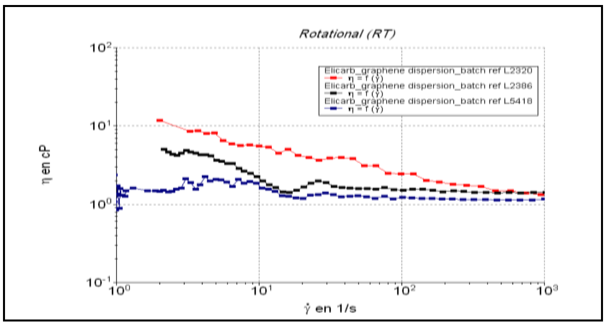

Figure 2: Rheologic profile of different composition Elicarb graphene dispersion

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 646155.