Formulaction
Smart scientific analysis

TURBISCAN LAB

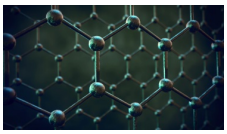
RAW MATERIALS

Graphene oxides dispersions

Optimizing the dispersion of fuctionalized graphenes in different solvents

Introduction

Graphene has come into the spotlight in nanoscience and nanotechnology since it was discovered in 2004. Its unique nanostructure and extraordinary mechanical, electrical and optical properties hold great promise for potential applications in many technological fields. Consequently, many progresses were made to provide commercial access to a large area of products.
Nevertheless, because of the cohesion energy between the 2D layer of molecules, the use of graphene in a dispersed phase is still very challenging as it is difficult to assure homogeneity in most organic solvents and water. Recently, several efforts have been made to modify the graphene with various methods to overcome this issue.



In this study extracted from literature, the dispersion of graphene oxide and its derivatives was analysed in different types of solvents to demonstrate the advantage of using the TSI to quantify and rank solvent efficiency in dispersing these oxides.

KEY **BENEFITS**

FAST

NO DILUTION

SENSITIVE

Reminder on the technique

Turbiscan® technology, based on Static Multiple Light Scattering, consists on sending a light source (880 nm) on a sample and acquiring backscattered (BS) and transmitted (T) signal all over the height of a sample.
By repeating this measurement over time at adapted frequency, the instrument enables to monitor physical stability.
The signal is directly linked to the particle concentration (φ) and size (d) according to the Mie theory: $\boldsymbol{BS} = \boldsymbol{f}(\varphi, \boldsymbol{d}, \boldsymbol{n_p}, \boldsymbol{n_f})$

Method

To evaluate the dispersibility of graphene oxide and its derivatives, graphene oxide and its derivative powders (Graphene oxide (**GO**), reduced graphene oxide (**rGO**), Ethylene Glycol-modified graphene oxide (**EG-rGO**), Graphene oxide with carboxyl groups (**COOH-GO**) were dispersed at a concentration of 0.1mg/L into 21 organics solvent classified in 3 categories: non-polar, polar protic and polar aprotic. Samples were analyzed using the Turbiscan® technology at 30°C .

Reference

J. Dai, G. Wang, et al. « Study on the surface energies and dispersibility of graphene oxide and its derivatives » *J Mater Sci* 50 (2015): 3895-3907

Results

✓ *Raw data*

The transmission signal for sample scanned along whole sample height over time are presented on Figure 1.

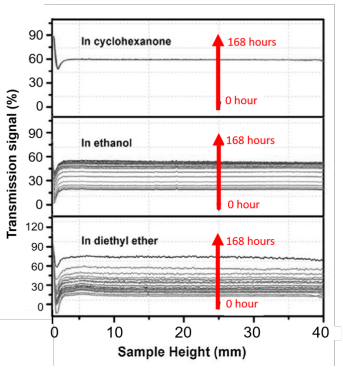


Figure 1: Transmission intensity variation of rGO in three different solvents

Figure 1 shows that for rGO prepared in diethyl ether and ethanol, transmission signal increases. In contrast, the transmission signal of rGO in cyclohexanone has no discernible change with time.