

The effect of nano graphene platelets addition on the mechanical performance of epoxy resin

Z. Paragkamian*, N.D. Alexopoulos

Department of Financial Engineering, University of the Aegean, Chios, Greece

P. Poulin

Université de Bordeaux, Centre de Recherché Paul Pascal – CNRS, Pessac, France

The present work investigates the effect of the addition of different nanographene platelets (NGP) of various concentrations in epoxy resin. NGPs of various geometrical dimensions (thickness of the layers) were exploited as reinforcement to improve the mechanical properties of the matrix. The required amount of NGPs was dispersed in a solvent by ultrasonication for 1 h. Then the required amount of epoxy resin was introduced into the above dispersion and mixed under vigorous mechanical stirring followed by ultrasonication for 30 min. The mixture was then degassed for about 20 min under vacuum until it was completely bubble free [1]. Afterwards, the hardener was added into the mixture, and the mixture was cast on metal mould (Figure 1a) and dried under vacuum in desiccators for overnight at room temperature. Then, they were allowed to cure at 120°C for further study. Tensile (Figure 1b) and fracture toughness specimens were produced with varying types of NGPs and NGPs concentration in the resin according to ASTM D638 and D5045 designations, respectively.



Figure 1: Photographs of the (a) metallic mould that tensile specimens were produced and (b) demoulded tensile specimens.

Tensile and fracture toughness tests were performed in an MTS-Insight 10 kN loading frame and according to their corresponding standard test methods. During the tests, time, force, extensometer, crack opening displacement and crosshead displacement were continuously monitored and recorded. It was found that the addition of NGPs essentially increased the tensile modulus of elasticity; the mechanical tensile test results will be explicitly discussed.

References

- [1] Vairis, Alexopoulos, Favvas, Nitodas and Stefopoulos, Proceedings of the ASME 2013 International Mechanical Engineering Congress & Exposition ASME 2013 November 15-21, 2013, San Diego, California, USA

* Zafeiroula Paragkamian, email: fme08082@fme.aegean.gr