

GRAPHENE AND RELATED MATERIALS (GRM) AS REINFORCEMENT IN EPOXY RESINS FOR STRUCTURAL APPLICATIONS

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ABSTRACT

A commercial two-components epoxy resin formulation was modified by adding graphene and related materials (GRMs). GRMs were used as additives in different concentration in order to improve thermo-mechanical properties of the final nano-composite thermoset. Different dispersion methods were taken into account in order to produce stable long lasting dispersion of the GRMs, that can withstand a commercial shelf life. Addition of the GRMs improves the glass transition temperature of the resin nanocomposite up to 20°C with respect to the plain commercial formulation. Moreover, while the Young's Modulus of the modified resins is not affected by the introduction of the nanofillers, the Figure shows that, when GRMs are added to the commercial formulation both stress and elongation at break increases up to almost 4 times the original values (Samples B-I) when graphene derivatives are added to the commercial formulation (Sample A) as reported in Figure 1.

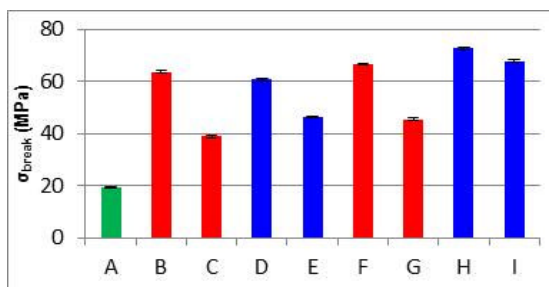


Fig. 1: Stress at break for epoxy resins, plain (A) and modified with GRMs (B-I)

Owing to the encouraging results obtained with the plain nanocomposites, the industrial curing of some of the more promising modified resins was computer-simulated when the two-components resins are used to produce a long carbon fiber reinforced thick composite. Simulation results show that some of the GRMs applied helps reducing or even completely preventing the overheat phenomena that are prone to occur in such a severe situation.¹ This effect would contribute reducing the time required for a single industrial production cycle, since no time for overheat dispersion is required, thus helping increasing the production rate.

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References

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