ON THE OPTIMIZATION OF CARBON NANOTUBE-ENRICHED MULTIFUNCTIONAL COMPOSITES: MECHANICAL AND ELECTRICAL APPROACH

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The mechanical and electrical properties of epoxy resin-based composites can be remarkably improved by adding carbon nanotubes (CNTs). Due to the fact that CNTs are mechanically very stable, light and electrically conductive, a variation of their filling level in a composite matrix could significantly influence the above mentioned properties [1]. For this reason, CNT-enriched composites might offer great potential for the development of structurally integrated electronics used in structural health monitoring (SHM). This allows timely detection of structural damage, seen as an important issue in many fields such as aerospace, automotive, marine and sports equipment [2].

One of the main issues that must be considered in the fabrication of CNT-enriched composites is the uniform distribution of CNTs in the composite matrix. The agglomeration of CNTs caused by van der Waals forces must be avoided to obtain the desired properties [3].

In this work, optimization steps for the preparation of CNT-enriched composites are carried out. These include the formulation of an epoxy resin-based, CNT-enriched ink in an organic dispersion medium. Here, the amounts of ink components are varied in a test strategy based on Design of Experiment (DoE). Subsequently, the physical properties of the ink are firstly tested to optimize the printability. Secondly, after printing using Nanojet and curing, the mechanical and electrical properties of the composite are tested. Finally, conclusions are drawn about the qualitative effects of the added components on the performance of the CNT-enriched composite.

References

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