

# Nanocomposites and Nanomaterials

## Toughening of Thermosetting Cyanate Ester Hybrid Resins with Commercially Available Nanodispersed SiO<sub>2</sub>

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The goal of the present work was the development of toughened matrices based on cyanate ester (CE) resin for the use in filament wound fiber-reinforced composites. The new matrix material should fulfill various requirements such as high thermal stability, improved toughness and suitable rheological behavior.

CE resins are high-performance materials suitable to replace epoxy resins due to their good processability, high thermal stability, high moisture resistance and good dielectric properties. CE resins cure thermally induced by a self-cyclotrimerization process, building a three-dimensional network structure which is very brittle [1]. It is known that CE can be hybridized with epoxy groups in order to build a wider-meshed thermosetting structure for increasing the toughness [2].

Over the last decades, tougheners such as functionalized liquid rubbers, high-performance thermoplasts or self-assembling block-copolymers have been proved their ability to improve the toughness of brittle thermosets. Unfortunately, these tougheners have some unfavorable effects on other important properties as they may increase the viscosity and reduce the elastic modulus and the glass transition temperature. In this work the addition of commercial nanoscaled SiO<sub>2</sub> [3] that is already well dispersed in epoxy resin masterbatch could be successfully applied as toughener and proved to be the right choice for reaching the above mentioned targets.

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2. *Ren P., Liang G., Zhang Z.* Epoxy-Modified Cyanate Ester Resin and Its High Modulus Carbon-Fiber Composites // Polymer Composites-2006.-**27**.-P. 402-409.
3. *Swaminathan G., Hossain M., Shivakumar K.N.* Mechanical Characterization of Nanosilica/Epoxy Nanocomposites. 51<sup>st</sup> AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, 12-15 April 2010, Orlando, Florida.