# The synergistic effect of hybrid fillers on the thermomechanical properties of epoxy nanocomposites

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Nanocomposites show different properties than the bulk polymer matrix because of the small size of the filler and the corresponding increased specific surface area. Additionally, certain polymer nanocomposites based on hybrid fillers have been shown to undergo more substantial improvements in mechanical, thermal, electrical and dielectric properties, than those containing a single filler type. The synergy of fillers, which may even differ in terms of chemical structure, shape and size, seems to play a dominant role on the properties of the composites [1-4]. For our investigation, specimens were prepared by dispersing two types of conductive fillers (CB and/or MWCNTs) and clay in an epoxy matrix, in different proportions. Particularly, we used diglycidyl ether of bisphenol A (DGEBA) resin with triethylenetetramine (TETA) hardener for the host material, while different amounts of CB, amine modified MWCNTs and organomodified nanoclay (Cloisite 30A) were used as fillers. The production procedure is fully presented elsewhere [5]. For the characterization of the nanocomposites, Scanning and Transmission Electron Microscopy (SEM and TEM), Dynamic Mechanical Analysis (DMA), Raman and IR spectroscopy techniques were carried out. It was found that the addition of low amounts of clay into carbon-loaded epoxy nanocomposites can modify several of its properties such as mechanical, electrical, glass transition and crystallization processes. A major parameter explaining these effects is the excluded volume created by the μm-scale clay clusters forming a segregated network of nanoparticles [1].

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