COMPOSITES OF CYANATE ESTER RESINS WITH NANOFILLERS OF DIFFERENT NATURE

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ABSTRACT

Functional composites of Cyanate Ester Resins (CER) are applied in aerospace industry for producing radomes, nose cones, antennae, radar-absorbing structures, communication satellites, microelectronics packaging, multilayer circuit boards, multichip modules. As far as the polymers of CER, polycyanurates (PCN), possess high brittleness inherent to all the high crosslink density polymer networks, they are modified by reactive oligomers, elastomers, thermoplastics [1]; PCN are used as E-glass laminates, carbon fiber laminates [2]. Recently, first publications have appeared on synthesis and characterization of CER based nanocomposites with such fillers as organically modified montmorillonite (MMT), carbon nanotubes (CNTs), polyhedral oligomeric silsesquioxanes (POSS). In this work the influence of nanofillers of different structure on peculiarities of PCN network formation, phase structure (nanoheterogeneity), physical-mechanical properties and thermal behavior the resulting material has been studied. It has been shown that chemical functionalization of nanofiller surface by the groups reactive towards cyanate groups of CER provides better dispersing of nanofiller particles inside polymer matrix leading to formation of fine structures and ensuring higher properties. The nanocomposites of cyanate esters of bisphenol A and E with hydroxyl-functionalized MMT, multiwall CNTs, epoxy-functionalized POSS have been synthesized and characterized. It has been found that when the functionalized nanofillers are used the chemical grafting of the filler to the PCN matrix has place through the reaction of surface functional groups of the nanofiller with cyanate groups of the growing PCN network. The phase structure of the novel nanocomposites is characterized by dual nanoheterogeneity, as a result of combination of the inside nanoheterogeneity of the PCN network [3] and the nanoheterogeneity induced by the presence of nano-sized particles of the filler in the system. Increasing elastic modulus and thermal stability of the resulting nanocomposites have been fixed.

References

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