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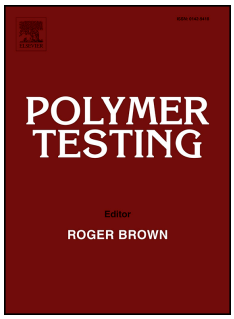

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Role of silica nanoparticles on network formation and properties in thermoset polycarbonate based nanocomposites

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Abstract

Nanocomposites based on thermoset polycarbonate and fumed silica nanoparticles were prepared by radical in situ polymerization. To avoid nanoparticle agglomeration, silica nanoparticles modified with a vinyl end capped silane agent were also used. The effect of silica particles and silica surface modification on the extent of polymerization and network density was evaluated. Silica nanoparticles reduce the amount of soluble oligomeric species forming during the diallyl carbonate polymerization and this is particularly pronounced in the case of modified silica. Nevertheless, the participation of surface modifier reactive groups to polymerization also caused a lower polycarbonate network density. SEM analysis showed that the proposed interfacial strategy is effective to control nanoparticle dispersion; no agglomeration phenomena were observed using modified silica. Nanocomposites preserve the polycarbonate stiffness while a toughness increase was recorded with the addition of neat silica. Particularly interesting is the effect of nanoparticles on the improvement of the abrasion resistance of the polycarbonate thus overcoming one of the drawback of this material.

KEYWORDS: CR39, radical polymerization, cross-linking density, abrasion