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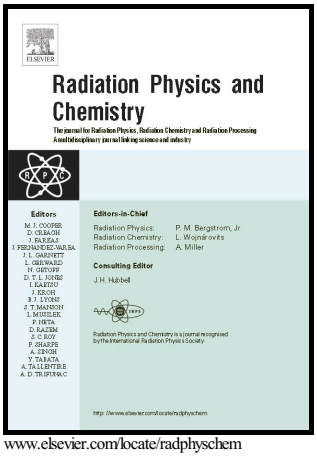

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Effect of gamma irradiation on properties of ultrafine rubbers as toughening filler in polybenzoxazine

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ABSTRACT

Three types of ultrafine fully vulcanized powdered rubbers (UFRs), i.e. natural rubber (NR), carboxylated nitrile-butadiene rubber (XNBR), and carboxylated styrene-butadiene rubber (XSBR) were prepared by combined technology between gamma irradiation for crosslinking and spray drying. The effects of doses in a range of 0 - 250 kGy on swelling ratio, crosslink density, and thermal stability of UFRs were investigated. Smaller particle size of UFRs was obtained at higher dose. A decrease in the swelling ratio and an increase in crosslink density were well corresponded to crosslinking effect related with absorbed dose. The increase in dose was also found to improve thermal performance of URFs. The influence of irradiated UFRs on impact resistance and glass transition temperature (T_g) of polybenzoxazine composites was also evaluated. The highest impact resistance of the composites belonged to the composite filled with irradiated UFXNBR at 200 kGy. While the significantly enhanced T_g of the composite was obtained by an addition of irradiated UFRs with higher doses, i.e. T_g = 173^{o}C for the composite filled with irradiated UFXNBR at 250 kGy. As a consequence, the UFRs can be used to effectively modify thermal and mechanical properties, especially impact resistance of polybenzoxazine composites.

Keywords: Gamma ray; Ultrafine rubber; Acrylonitrile; Particle size; Compatibility.