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The influence of irradiated recycled polypropylene compatibilizer on the impact fracture behavior of recycled polypropylene /microcrystalline cellulose composites (Article)

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Abstract

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The poor compatibility between a thermoplastic matrix and natural fiber reinforcement has been a limitation in the optimization of natural fiber-filled composites. Electron beam irradiation is used to modify the structure of materials. However, most researches have focused on the effect of irradiation after the fabrication of composites. Hence, this study was aimed at investigating the effect of irradiated recycled polypropylene (i-rPP) as a compatibilizer in recycled polypropylene (rPP) composites. The rPP were irradiated at different doses before the compounding process. The rPP matrices were prepared by mixing the unirradiated and irradiated rPP at ratios of 90:10 and 50:50, before they were compounded with different amounts of microcrystalline cellulose (MCC) fibers (5, 20, and 40 wt%). Radiation crosslinking, functional groups, radical formations, thermal, and impact strength characterizations were carried out. The results showed that the simultaneous incorporation of the i-rPP and MCC fibers significantly improved the impact resistance of the rPP. The synergistic combination of a higher MCC content (40 wt%) and low irradiation dose (10 kGy) at a ratio of 50:50 caused a higher degree of crosslinking and a lower radical concentration. The thermal stability was acceptable and the sub-impact fracture surface analysis revealed the effects of crack blunting. POLYM. COMPOS., 40:E24–E34, 2019. © 2017 Society of Plastics Engineers. © 2017 Society of Plastics Engineers

SciVal Topic Prominence

Topic: Composite materials | Mechanical properties | coconut shell

Prominence percentile: 62.438

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Indexed keywords

Engineering controlled terms: Cellulose, Fracture, Fracture mechanics, Impact strength, Irradiation, Natural fibers, Polymer matrix composites, Polypropylenes, Surface analysis

Engineering uncontrolled terms: Degree of cross-linking, Electron beam irradiation, Impact fracture behavior, Microcrystalline cellulose, Radiation cross-linking, Recycled polypropylene, Strength characterization, Synergistic combinations

Engineering main heading: Plastic recycling

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