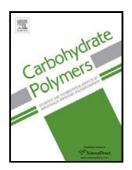
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Effect of Modified Starch and Nanoclay Particles on Biodegradability and Mechanical Properties of Cross-linked Poly Lactic Acid

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Abstract: Mechanical properties and biodegradation of cross-linked poly(lactic acid) (PLA)/ 7 maleated thermoplastic starch (MTPS)/ montmorillonite (MMT) nanocomposite were studied. 8 Crosslinking was carried out by adding di-cumyl peroxide (DCP) in the presence of triallyl 9 isocyanurate (TAIC) as coagent. At first, MTPS was prepared by grafting maleic anhydride 10 (MA) to thermoplastic starch in internal mixer. Experimental design was performed by using 11 Box-Behnken method at three variables; MTPS, nanoclay and TAIC at three levels. Results 12 showed that increasing TAIC amount substantially increased the gel fraction, enhanced tensile 13 strength, and caused a decrease in elongation at break. Biodegradation was prevented by 14 increasing TAIC amount in nanocomposite. Increasing MTPS amount caused a slight increase in 15 gel fraction and decreased the tensile strength of nanocomposite. Also, MTPS could increase the 16 elongation at break of nanocomposite and improve the biodegradation. Nanoclay had no effect 17 on the gel fraction, but it improved tensile strength. 18

19 Highlights

- Full green cross-linked PLA/MTPS/MMT nanocomposite was prepared
- Modified thermoplastic starch was more compatible with PLA
- Nanoclay did not affect cross-linked PLA gel fraction but improved tensile strength
- By the addition of MTPS and nanoclay, biodegradability of composites was improved

24 Key words

25 Biopolymers, Poly(lactic acid), Chemical crosslinking, Thermoplastic starch, Nanocomposite

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