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Reactive extrusion of glycerylated starch and starch-polyester graft copolymers

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ABSTRACT

Maleated thermoplastic starch (MTPS) was prepared through in situ reactive modification of thermoplastic starch (TPS) with maleic anhydride (MA) as esterification agent and glycerol as a plasticizer. Melt-blends of 60 wt. % poly(butylene adipate-co-terephthalate) (PBAT) with 40 wt. % of TPS or MTPS were then prepared by reactive extrusion to produce PBAT/TPS and PBAT/MTPS, respectively. Soxhlet extraction in acetone was then used to extract any un-grafted glycerol from these blend systems. Analysis of the acetone extracted product was performed using GC, FTIR and TGA. The residues from the soxhlet extractions were analysed by FTIR and TGA. GC analysis showed that the acetone extraction was a very effective technique to extract free glycerol from the system. Furthermore, the combination of TGA and the gravimetric results after extraction was an effective method to determine the amount of glycerol grafted on the starch backbone. We observed that introducing 2 wt. % of MA to the system significantly increased glycerol grafting onto the starch backbone. Evidence for grafting of PBAT onto the maleated and glycerylated thermoplastic starch was obtained from dichloromethane (DCM) soxhlet extraction on the PBAT/TPS and PBAT/MTPS resins. The DCM soxhlet extracted fraction and the residue remaining in the thimble were analysed by FTIR and TGA. The presence of MA on the starch backbone was shown to enhance the

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