

## Preparation and Characterization of Low-Density Polyethylene/Thermoplastic Starch Composites

M. D. H. Beg, S. Kormin, M. Bijarimi and Haydar U. Zaman

Faculty of Chemical & Natural Resources Engineering, University of Malaysia Pahang, Kuantan,  
Pahang Darul Makmur, Malaysia

### ABSTRACT

In this study, sago starch was physically blended with low-density polyethylene (LDPE) via the melt blending process followed by injection molding to produce LDPE/sago starch (LPS) composites. The sago starch content was varied from 5 to 30 wt% of LDPE. The addition of starch to LDPE reduced the melt flow rate (MFR), the tensile strength, and impact strength, whereas the tensile modulus, flexural strength, and flexural modulus increased. To improve poor mechanical properties of the LPS, LDPE/glycerol thermoplastic starch (LPGTS) or LDPE/2:1 mixture of glycerol and urea thermoplastic starch (LPMTS) was used in this study. The effect of compatibilizer (maleic anhydride) on properties of the LPMTS specimens was also investigated. The LPS, LPGTS, LPMTS, and maleic anhydride treated LPMTS (LPMTSM) samples were analyzed for the MFR, mechanical properties (tensile, flexural, and impact tests), thermal (TGA and DSC), and morphological properties. As a result, the incorporation of plasticizers or compatibilizer into LPS caused the considerable improvement in MFR and mechanical properties. Moreover, the presence of compatibilizer produced better properties for the LPMTSM sample than for the other samples, indicating better dispersion and homogeneity of starch to the matrix. In addition, thermal stability, DSC, and phase morphology were carried out for different LPS samples.

**KEYWORDS:** Composites; Extrusion; LDPE; Mechanical and thermal properties; Sago starch

**DOI:** [10.1002/adv.21521](https://doi.org/10.1002/adv.21521)