Optimisation of processing variables of Kenaf derived cellulose reinforce polylactic acid

Abstract

Optimisation of composite processing variables (temperature and time) was carried out by monitoring both the stabilisation zone (to ensure composite is well mix at sufficient duration) and the maximum mixing temperature (below 200 °C to avoid fibre degradation) by analysing mixing torque curves upon compounding 5 wt % KDC/PLA using Brabender internal mixer at 160-180 °C for 10, 20 and 30 min., respectively. The composites were pressed and cut into tensile test specimens prior to testing. The 5 wt % KDC/PLA composite demonstrated an optimum tensile strength at three combinations of variables, however the best condition was chosen at 170 °C for 30 min for preparation of composites at various KDC loading (0-60 wt %). The effect of KDC loading on the tensile strength and modulus of composites were investigated. The results demonstrated that increasing KDC loading from 0-60 wt % enhanced the tensile strength and the tensile modulus up to 34 and 107 %, respectively. The a-cellulose was initially derived from kenaf fibre (from bast) by removal of lignin and hemicellulose via chemical (chlorination and mercerization) processes. The absence of these components in the FTIR spectral peaks confirms their removal after been chemically treated.

Keyword: Polylactic acid; Derived cellulose; Tensile properties; Mixing torque; FTIR