

Plasticized and nanofilled poly(lactic acid) nanocomposites: mechanical, thermal and morphology properties

ABSTRACT

Poly(lactic acid) (PLA)-based nanocomposites filled with graphene nanoplatelets (xGnP) and containing epoxidized palm oil (EPO) as plasticizer were prepared by melt blending method. PLA was first plasticized by EPO to improve its flexibility and thereby overcome its problem of brittleness. Then, xGnP was incorporated into plasticized PLA to enhance its mechanical properties. Plasticized and nanofilled PLA nanocomposites (PLA/EPO/xGnP) showed improvement in the elongation at break by 61% compared with plasticized PLA (PLA/EPO). The use of EPO and xGnP increases the mobility of the polymeric chains, thereby improving the flexibility and plastic deformation of PLA. The nanocomposites also resulted in an increase of up to 26.5% in the tensile strength compared with PLA/EPO blend. PLA/EPO reinforced with xGnP shows that increasing the xGnP content triggers a substantial increase in thermal stability. The TEM image of PLA/EPO/xGnP shows that the xGnP was uniformly dispersed in the PLA matrix and no obvious aggregation is observed.

Keyword: Graphene nanoplatelets; Plasticizer; Poly(lactic acid)