Poly(lactic acid)/acrylonitrile butadiene styrene nanocomposites with hybrid graphene nanoplatelet/organomontmorillonite: effect of processing temperatures

*M. Bijarimi[1] *, A. Syuhada[1] , N. Zulaini[1] , N. Shahadah[1] , W. Alhadadi[1] , M. N. Ahmad[2] , A. Ramli[1] , E. Normaya[2]*

[1] Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, Gambang, Pahang, Malaysia

[2] Experimental and Theoretical Research Laboratory, Department of Chemistry, Kulliyyah of Science, International Islamic University Malaysia, Kuantan, Pahang, Malaysia

ABSTRACT

This work reports the preparation and characterization of poly (lactic) acid/acrylonitrile butadiene styrene/graphene nanoplatelets/Cloisite C20A montmorillonite (PLA/ABS/GnP/C20A) nanocomposites via melt blending. The clay is hybridized with graphene to increase its dispersion in the polymer matrix. The melt processing temperatures play a vital role in the properties of the resulting nanocomposites in dictating the extent of thermal stability and dispersion of the fillers. The hybrid nanocomposites were characterized for stress-strain, thermal, chemical, and morphological properties. The findings were that there was an increase in the mechanical properties in terms of tensile strength and Young's modulus with the PLA/ABS/GnP/C20A at the high-temperature profile having the highest values of 43.1 MPa and 2533 MPa. The elongation at break increases slightly, due to the brittle properties of GnP. It was found that the dispersion of the fillers increased with increasing temperature profiles, as revealed by the morphological analysis by scanning electron microscopy (SEM) and transmission electron microscopy (TEM). The void size was also observed to be smaller and more homogenous with increasing temperature. However, in terms of thermal degradation analysis, the addition of fillers increases its thermal stability as the decomposition onset temperature increases by 22.58 degrees C.

KEYWORDS

Organo-modification; Nanoplatelets; ABS; Blends; Copolymer; Rubber; Acid; Microstructure; Reinforcement; Dispersion

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