Chemical modification of oil palm mesocarp fiber by methacrylate silane: effects on morphology, mechanical and dynamic mechanical properties of biodegradable hybrid composites

ABSTRACT

Effects of modifying oil palm mesocarp fibers (OPMF) by methacrylate silane on polylactic acid (PLA)/ polycaprolactone (PCL)/clay/OPMF hybrid composites were investigated. The composites were prepared by a melt blending technique and characterized by dynamic mechanical analysis (DMA) and scanning electron microscopy (SEM). The silane-treated OPMF hybrid composites showed better tensile strength, tensile modulus, and elongation at break than unmodified OPMF hybrid composites. DMA analysis showed an increase in storage modulus when silane-treated OPMF was added to a hybrid composite. The loss modulus curve showed that the incorporation of silane-treated OPMF into a hybrid composite shifted the two glass transition temperatures (*T*g) of composites closer to each other. The low tan δ peak indicated good fiber/matrix adhesion for the silane-treated OPMF hybrid composites. SEM micrographs revealed that silane-treated OPMF hybrid composites showed better fiber/matrix adhesion than unmodified OPMF hybrid composites because of absence of gap between silane-treated OPMF and the matrix in the composite.

Keyword: Oil palm mesocarp fiber; Chemical modification; Silane coupling agent; Hybrid composites