Flammability, morphological and mechanical properties of sugar palm fiber/polyester yarn-reinforced epoxy hybrid biocomposites with magnesium hydroxide flame retardant filler

ABSTRACT

This paper aims to study the surface morphology, flammability and tensile properties of sugar palm fiber (SPF) hybrid with polyester (PET) yarn-reinforced epoxy composite with the addition of magnesium hydroxide (Mg(OH)2) as a flame retardant. The composites were prepared by hybridized epoxy and Mg(OH)2/PET with different amounts of SPF contents (0%, 20%, 35% and 50%) using the cold press method. Then these composites were tested by horizontal burning analysis, tensile strength testing and scanning electron microscopy (SEM) analysis. The specimen with 35% SPF (Epoxy/PET/SPF-35) with the incorporation of Mg(OH)2 as a flame retardant showed the lowest burning rate of 13.25 mm/min. The flame took a longer time to propagate along with the Epoxy/PET/SPF-35 specimen and at the same time producing char. Epoxy/PET/SPF-35 also had the highest tensile strength of 9.69 MPa. Tensile properties of the SPF hybrid with PET yarn (SPF/PET)-reinforced epoxy composite was decreased at 50% SPF content due to the lack of interfacial bonding between the fibers and matrix. Surface morphology analysis through SEM showed uniform distribution of the SPF and matrix with less adhesion, which increased the flammability and reduced the tensile properties of the hybrid polymeric composites. These composites have potential to be utilized in various applications, such as automotive components, building materials and in the aerospace industry.

Keyword: Hybrid composites; Flammability; Biocomposites; Magnesium hydroxide; Sugar palm fiber; Polyester yarn