World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Study on the Fabrication and Mechanical Characterization of Pineapple Fiber-Reinforced Unsaturated Polyester Resin Based Composites: Effect of Gamma Irradiation

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Abstract : Pineapple leaf fiber (PALF) reinforced polypropylene (PP) based composites were fabricated by a conventional compression molding technique. In this investigation, PALF composites were manufactured using different percentages of fiber, which were varying from 25-50% on the total weight of the composites. To fabricate the PALF/PP composites, untreated and treated fibers were selected. A systematic study was done to observe the physical, mechanical and interfacial behavior of the composites. In this study, mechanical properties of the composites such as tensile, impact and bending properties were observed precisely. It was found that 45wt% of fiber composites showed better mechanical properties than others. Maximum tensile strength (TS) and bending strength (BS) was observed, 65 MPa and 50 MPa respectively, whereas the highest tensile modulus (TM) and bending modulus (BM) was examined, 1.7 GPa and 0.85 GPa respectively. The PALF/PP based composites were treated with irradiated under gamma radiation (the source strength 50 kCi Cobalt-60) of various doses (2.5 kGy to 10 kGy). The effect of gamma radiation on the composites was also investigated, and it found that the effect of 5.0 kGy (i.e. units for radiation measurement is 'gray', kGy=kilogray) gamma dose showed better mechanical properties than other doses. The values of TS, BS, TM, and BM of the irradiated (5.0 kGy) composites were found to improve by 19%, 23%, 17% and 25 % over non-irradiated composites. After flexural testing, fracture sides of the untreated and treated both composites were studied by scanning electron microscope (SEM). SEM results of the treated PALF/PP based composites showed better fiber-matrix adhesion and interfacial bonding than untreated PALF/PP based composites. Water uptake and soil degradation tests of untreated and treated composites were also investigated.

Keywords : PALF, polypropylene, compression molding technique, gamma radiation, mechanical properties, scanning electron microscope
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020