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Investigating the synergistic effect of olive trunk leaves powder and pineapple leaf fibers on the physical, tensile, and thermal properties of epoxy-based composites

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Abstract

The study evaluated the effect of adding different proportions (3/7, 1/1, and 7/3) of pineapple leaf fiber to composites reinforced with olive trunk leaves powder by measuring tensile properties, moisture absorption, and thermal stability. The results showed that the proportion of pineapple leaf fiber in the hybrid composites strongly influenced tensile properties, moisture absorption, and thermal stability. Increasing pineapple leaf fiber loading from 12 wt% to 28 wt% resulted in an important increase in tensile strength, namely an average of 46%. However, the tensile strength and Young's modulus of the hybrid composites were inferior to those of the parent composites, which could be attributed to the relative inability of the hybrid composites to withstand tensile loads. Thermo-gravimetric analysis results showed that the introduction of even the lowest amount of pineapple leaf fibers in the olive trunk leaves improved the thermal stability of the composites, bringing the degradation onset above 240°C, therefore suggesting the possibility of a future processing with most thermoplastic matrices. The differences in thermal stability between epoxy composites with 7/3 olive trunk leaves powder/pineapple leaf fiber, 1/1 olive trunk leaves powder/pineapple leaf fiber, and 3/7 olive trunk leaves powder/pineapple leaf fiber were very limited. Regarding moisture absorption, the presence of olive trunk leaves powder considerably reduced the weight gain, and also passing from 1/1 to 7/3 olive trunk leaves/pineapple leaf fibers offered a distinct advantage, measurable as more than 1% reduction in water saturation content.

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DATA AVAILABILITY STATEMENT

No data are available.