

Abstract

The mechanical performance of natural fiber-reinforced polymer composites depends on fiber characteristics, matrix properties, and interfacial modifications. Although surface treatments such as polishing, coatings, and film lamination are commonly applied to enhance appearance, durability, or functionality, their effects on mechanical properties remain underexplored. This study investigates the influence of polypropylene (PP) and polyethylene terephthalate (PET) film lamination on the tensile behavior of wood fiber-reinforced polypropylene composites. Dumbbell-shaped specimens of neat PP and PP reinforced with 25 wt% wood fiber were fabricated via injection molding, then laminated with 0.1 mm PET or PP films using a plastic-compatible adhesive. Laminations were applied in four configurations: unlaminated (0S), single-sided lamination covering half the specimen length (1S-H), single-sided full-length lamination (1S-F), and double-sided full-length lamination (2S-F). PET film significantly improved tensile strength, with the 2S-F configuration yielding increases of 12% and 21% for neat PP and wood-filled PP, respectively. In contrast, PP film generally had minimal or negative effects, except in the 2S-F wood-filled case, which exhibited a 5% gain. Enhancements were attributed to PET's superior stiffness and to surface homogenization, which reduced surface defects and improved stress distribution—effects supported by rule-of-mixtures predictions and morphological analysis. Surface roughness measurements and SEM confirmed smoother profiles and sealed surface voids, while fractographic evidence indicated that lamination mitigated crack initiation at specimen corners. These findings demonstrate that film lamination, particularly with PET, is an effective post-processing strategy for improving the mechanical integrity of wood-plastic composites.