

Superheated steam treatment of oil palm mesocarp fiber improved the properties of fiber-polypropylene biocomposite

ABSTRACT

The effect of fiber surface modification by superheated steam (SHS) treatment and fiber content (30 to 50 wt.%) was evaluated relative to the mechanical, morphology, thermal, and water absorption properties of oil palm mesocarp fiber (OPMF)/polypropylene (PP) biocomposites. SHS treatment of OPMF was conducted between 190 and 230 °C for 1 h, then the SHS-treated fiber was subjected to melt-blending with PP for biocomposite production. The biocomposite prepared from SHS-OPMF treated at 210 °C with 30 wt.% fiber loading resulted in SHS-OPMF/PP biocomposites with a tensile strength of 20.5 MPa, 25% higher than untreated-OPMF/PP biocomposites. A significant reduction of water absorption by 31% and an improved thermal stability by 8% at T5% degradation were also recorded. Scanning electron microscopy images of fractured SHS-OPMF/PP biocomposites exhibited less fiber pull-out, indicating that SHS treatment improved interfacial adhesion between fiber and PP. The results demonstrated SHS treatment is an effective surface modification method for biocomposite production.

Keyword: Superheated steam treatment; Surface modification; Fiber-matrix bond; Biocomposite; Mechanical properties