

Dynamically controlled fibrillation under combination of ionic liquid with mechanical grinding

ABSTRACT

Combination of mortar grinder mill (MG) and ionic liquid (IL) treatment was employed in order to fibrillate fibers from oil palm mesocarp fiber (OPMF) in one-step. The structural changes of OPMF before and after the treatment were examined by Thermogravimetric analysis (TGA), Fourier transformed infrared (FT-IR) spectra, Wide-angle X-ray diffraction (WAXD), Dynamic light scattering (DLS) and Scanning electron microscopy (SEM). Compared with the only use of 1-butyl-3-methylimidazolium tetrafluoroborate (BMIM[BF₄]), combination of MG and IL helped to remove hemicellulose and lignin components partially from OPMF, and also fibrillated OPMF fibers at average particle diameter of 127 nm. Afterwards, the fibrillated fibers were utilized as reinforcement material for the purpose of enhancement of mechanical properties of poly(ϵ -caprolactone)(PCL). The addition of OPMF treated with the combined method led to a 64% increase in tensile strength in comparison with that of untreated OPMF. These results indicate that the combined method enables effective fibrillation.

Keyword: Cellulose and wood products; Composites; Ionic liquids; Polyesters