

All Biomass-based Composites: Poly (Lactic-acid) and Acetylated Lignin Compatibilization

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Blends of lignin containing hydrophilic hydroxyl groups and hydrophobic bio-polymers presented a challenge due to the lack of compatibility and dispersion of lignin. In this study, poly (lactic-acid) (PLA)/lignin films were prepared by solution casting technique. The lignin was acetylated to impose an appropriate number of hydrophobic ester groups to enhance the compatibility with PLA. The compatibility of acetylated lignin and PLA was investigated by calculating solubility parameters and analyzing morphology of the films. The calculated solubility parameter of acetylated lignin was $20.9 \text{ (J/cm}^3\text{)}^{0.5}$ allowing the good compatibility with PLA [$20.2 \text{ (J/cm}^3\text{)}^{0.5}$] whereas that of lignin was $26.3 \text{ (J/cm}^3\text{)}^{0.5}$. The aggregation size of acetylated lignin was smaller than lignin due to the enhanced compatibility with PLA. Consequently, the optical transparency of PLA/lignin films increased up to 65% at wavelength of 750 nm after acetylation. The enhanced compatibility of the PLA/acetylated lignin was expected to find its applications in various eco-friendly industries such as food packaging, mulch film, and etc.