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Polypropylene nanocomposites reinforced with plant-derived cellulose nanocrystals

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Chemical modifications have been widely adopted for improving the dispersibility of Cellulose Nanocrystals (CNCs) in nonpolar matrixes. Nonetheless, an engineering design for improving the CNC structure is still challenging due to the differences in the dispersion level of CNCs depending on the modification strategies in a desired matrix. The current study was conducted to find an appropriate functionalization technique for CNCs and an effective manufacturing process for CNC-Polypropylene (PP) nanocomposites. The surface structures of CNCs were successfully changed using Toluene Diisocyanate (TDI) and Maleic Anhydride grafted PP (MAPP). The composites with the MAPP grafted CNCs showed better tensile strength when compared with those from pristine and TDI grafted CNC systems. A melt-extrusion process with pre-dispersion processing exhibited a more positive effect on the strength of the nanocomposites in comparison to the systems without pre-dispersion. Scanning and transmission electron microscopes also provided clear evidence of the dispersion levels of unmodified and modified CNCs in the PP matrix.

Recent Publications

1. J G Gwon, et al. (2016) Physiochemical, optical and mechanical properties of poly (lactic acid) nanocomposites with toluene diisocyanate grafted cellulose nanocrystals. *RSC Advances*; 6(12): 9438-9445.
2. J G Gwon, et al. (2016) Mechanical and thermal properties of toluene diisocyanate-modified cellulose nanocrystal nanocomposites using semi-crystalline poly(lactic-acid) as a base matrix. *RSC Advances*; 6(77): 73879-73886.

References

1. L Carlsson, et al. (2015) Surface characteristics of cellulose nanoparticles grafted by surface-initiated ring-opening polymerization of ϵ -caprolactone. *Cellulose*; 22(2): 1063- 1074.
2. Y Habibi (2014) Key advances in the chemical modification of nanocellulose. *Chemical Society Reviews*; 43(5): 1519- 1542.

Biography

Jae-Gyoung Gwon has obtained his BS and MS in Chemical Engineering from University of Seoul, South Korea. He has further completed his PhD degree in Forest Products from University of Seoul and has worked as a Post-doctorate in National Institute of Forest Science. He has worked as a Research Scientist in National Institute of Forest Science. His specialized research areas are nanocellulose applications, polymer composites and chemical analyses.

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