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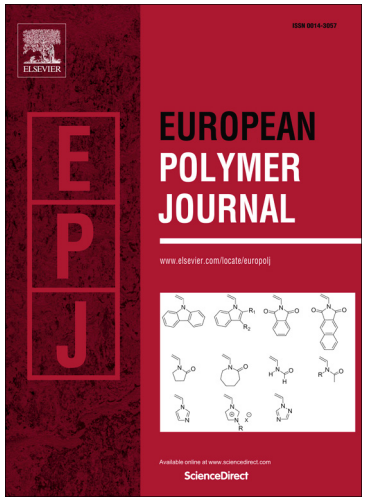

Lignocellulosic nanostructures as reinforcement in extruded and solvent casted polymeric nanocomposites: An overview

E. Fortunati, W. Yang, F. Luzi, J. Kenny, L. Torre, D. Puglia

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Lignocellulosic nanostructures as reinforcement in extruded and solvent casted polymeric nanocomposites: an overview

E. Fortunati, W. Yang, F. Luzi, J. Kenny, L. Torre, D. Puglia*

University of Perugia, Civil and Environmental Engineering Department
Materials Engineering Center, UdR INSTM, Terni – Italy

**Corresponding author:* debora.puglia@unipg.it; Tel +390744492916; Fax +390744492950

Abstract

Lignocellulosic nanostructures, mainly cellulose and lignin based nanoscaled materials, have recently attracted much attention due to their renewable nature, wide variety of source materials available throughout the world, low cost and density, high surface functionality and reactivity. The exceptional mechanical strength, together with high aspect ratio and large surface area, enable these nanomaterials to reinforce a wide variety of polymers even at very low filler loadings. Furthermore, nanocomposite approach has emerged in the last two decades as an efficient strategy to upgrade the structural and functional properties of natural and/or synthetic polymers. The combination of bioresorbable and sustainable polymers with bio-based nanostructures opened new perspectives in the self-assembly of nanomaterials for different applications with tuneable mechanical, thermal and degradative properties. In the present paper, the effect of introduction of lignocellulosic reinforcement phases (cellulosic and lignin based nanostructures), on structural and functional properties of several thermoplastic polymer matrices was investigated at the nanoscaled level. Both solvent casting and melt compounding were considered as processing techniques for the proposed nanocomposite formulations. The role of cellulose and lignin based nanostructures, such as their synergic action when embedded in a polymer matrix, were analysed (taking into account the required functionality of the systems in the appropriate final applications) and reported in terms of morphological, optical, thermal, chemical, mechanical, barrier and degradative performance.

Keywords: cellulose nanocrystals, lignin nanoparticles, nanocomposites, solvent casting, melt mixing, ternary systems.