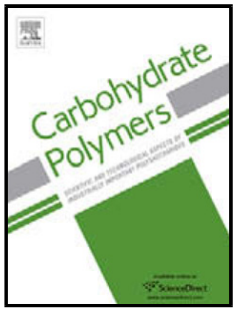

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The role of cellulose nanocrystals incorporation route in waterborne polyurethane for preparation of electrospun nanocomposites mats

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Abstract

Electrospinning offers the possibility of obtaining fibers mats from polymer solutions. The use of environmentally-friendly waterborne polyurethane (WBPU) allows obtaining electrospun polyurethane mats in water medium. Furthermore, the incorporation of water dispersible nanoentities, like renewable cellulose nanocrystals (CNC), is facilitated. Therefore, in this work, a WBPU was synthesized and CNC were isolated for preparing WBPU-CNC dispersions nanocomposites with 1 and 3 wt% of CNC following both the classical mixing by sonication, and the innovative *in-situ* route. The dispersions were used for obtaining electrospun mats assisted by poly(ethylene oxide) (PEO) as polymer template. Moreover, the extraction of PEO with water resulted in continuous WBPU-CNC mats, showing different properties respect to WBPU-CNC mats containing PEO. The effective addition of CNC led to more defined cylindrical morphologies and the two alternative incorporation routes induced to different CNC dispositions in the matrix, which modified fibers diameters, and thus, mats final properties.

Keywords

Waterborne polyurethane
Cellulose nanocrystals
Electrospun nanocomposites
Morphology
Surface behavior

1. Introduction

Electrospinning is a suitable technique for obtaining mat of fibers in the nano and micrometer diameter range from a polymer solution induced by electric fields (Torres-Giner, Pérez-Masiá, & Lagaron, 2016). The fundamental of the process is based on the application of an electric field between the capillary syringe tip, where the polymer