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Electrospun nanofibers from natural polymers and their application

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ABSTRACT

Due to their small structure and large number of micropores, nanofibers can be employed effectively in a variety of applications, including drug delivery, wound dressing, tissue engineering, filtration, and in cosmetic products. Several fabrication techniques have recently been developed to produce nanofibers. Electrospinning has been widely used owing to its high-degree of flexibility in fabrication and its suitability for use in industrial-scale production. Both synthetic and natural polymers have been employed in the process of electrospinning nanofibers. Natural polymers appear to be particularly attractive materials for use in this process because their structures are similar to those found in extracellular matrices prevalent in the human body, resulting in a compatible interaction with this biological environment. This review summarizes the current development of nanofibers produced from natural polymers and their application in various fields. Fabrication limitations and future application are also considered.

Keywords: electrospinning; electrospun nanofiber; wound dressing; drug carrier; shellac

1. INTRODUCTION

Nanomaterials, which measure less than 100 nm in size, have been widely commercialized and increasingly utilized as commodities in various areas, such as healthcare, electronics, and cosmetics because of their unique physical and chemical characteristics.

Nanofibers, which feature a diameter range of 1-100 nm, have attracted considerable interest in several fields, such as wound healing, tissue engineering scaffold, sensor, air filtration, and drug delivery, because of their unique characteristics, including ultra-porous structure and large surface area-to-volume ratio. The number of studies on the development of electrospun nanofibers has dramatically increased in recent years because of the potential practicality and functionalization of these materials. In this review, an overall description of nanofibers, including enabling techniques, recent fabrication processes, unique properties, the polymers employed for preparing nanofibers, and the possible applications of electrospun nanofibers with notable properties, is provided. In particular, natural polymers have been considered for development in the future. The current trends in the production and application of nanofibers will also be presented.

2. FABRICATION OF NANOFIBERS

Nanofibers can currently be prepared using a variety of methods, which include drawing, phase separation, template synthesis, self-assembly, and electrospinning. The details of each methodology are described as follows.