A SHORT REVIEW OF POLYMER-BASED ELECTROSPUN NANOFIBER MEMBRANES FOR WASTEWATER TREATMENT

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ABSTRACT This paper aims to review the various materials that can be used to develop a nanofiber membrane for wastewater treatment using the needleless electrospinning method. The needleless electrospinning technique is a promising method for producing nanofiber membranes as it allows for the creation of fibers with diameters in the nanometer range, leading to high surface area to volume ratio and increased membrane efficiency. The materials that will be reviewed in this paper include polymers such as polyvinyl alcohol, polyethylene oxide, and polyacrylonitrile. These polymers have been widely studied for their potential use in wastewater treatment due to their high mechanical strength and chemical stability. The paper will also review the use of natural materials such as chitosan, which have been shown to have good biocompatibility and biodegradability properties. Finally, the paper will discuss the potential applications of the nanofiber membrane in wastewater treatment, including the removal of pollutants such as heavy metals, dyes, and bacteria. Overall, this paper aims to provide a comprehensive overview of the materials that can be used to develop a nanofiber membrane for wastewater treatment using the needleless electrospinning method and the potential applications for the wastewater treatment.

Keywords: nanofiber, membrane, needleless electrospinning, wastewater treatment

1. INTRODUCTION

Polymer-based electrospun nanofiber membranes have emerged as a promising technology for wastewater treatment due to their unique properties, such as high surface area, high porosity, and tunable pore size distribution. These membranes are composed of polymer fibers with diameters ranging from a few nanometers to several micrometers, which are electrospun onto a substrate to form a thin, non-woven, and highly porous membrane. Generally, the conventional needle-based electrospinning technology present several challenges which are needle clogging and low production rate. Other than that, it has limitations in controlling the fiber morphology, scalability and safety concerns. Therefore, needleless electrospinning was designed to overcome the shortcomings of conventional needle based electrospinning technology.

The objective of the research, is to review the potential materials that

can be used to develop a needleless electrospinning nanofiber membrane for wastewater treatment [1]. The study starts by emphasising the significance of this research issue by stating that needleless electrospinning is a potential technology for developing nanofiber membranes. This is due to the technique's ability to produce fibres of nanoscale sizes, resulting in a high surface area to volume ratio and higher membrane efficiency.

In the introduction also briefly mentions the important materials that will be discussed in the study, such as the materials that will be evaluated, which include polymers and natural materials. Furthermore, the introduction states that the article will examine the potential applications of the nanofiber membrane in wastewater treatment as well as identify areas for future research. The subtopic will be discussed in the study shown in Figure 1.

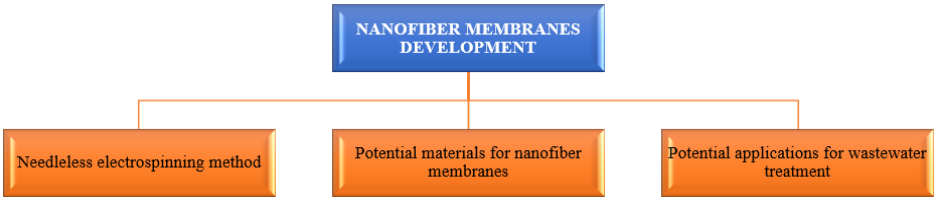

Figure 1. Subtopic in Nanofiber Membranes Development to be discussed

2. NEEDLELESS ELECTROSPINNING METHOD FOR NANOFIBER MEMBRANE DEVELOPMENT

A needleless electrospinning method is a powerful tool for the development of nanofiber membranes for wastewater treatment. This method involves using an electric field to pull a polymer solution or melt through a small aperture, which forms fibers with diameters in the nanometer range.

The small fiber diameter produced by the needleless electrospinning method is one of its greatest advantages [2]. The high surface area to volume ratio of the fibers increases the membrane's efficiency and ability to remove pollutants from wastewater. Furthermore, the small pore size of the fibers allows for the removal of even small pollutants, such as bacteria and viruses. This method can be used to produce nanofiber membranes from a wide range of polymers, including synthetic and natural polymers. This allows for the production of nanofiber membranes with a variety of properties and characteristics, making it a versatile method for producing nanofiber membranes. Additionally, the needleless electrospinning method is a relatively simple process that does not require the use of