Membrane manufacturing via simultaneous electrospinning of PAN and PSU solutions

Serkan Guclu\textsuperscript{a,b}, Mehmet Emin Pasaoglu\textsuperscript{a,b}, Ismail Koyuncu\textsuperscript{a,b,*}

\textsuperscript{a}Turkish National Research Center on Membrane Technologies (MEM-TEK), Istanbul Technical University, Maslak, Istanbul, Turkey, Tel. +90 2122853473; Fax: +90 2122856667; emails: gucluse@itu.edu.tr (S. Guclu), mpasaoglu@itu.edu.tr (M.E. Pasaoglu), koyuncu@itu.edu.tr (I. Koyuncu)

\textsuperscript{b}Environmental Engineering Department, Istanbul Technical University, Maslak, Istanbul, Turkey, Tel. +90 2122853789; Fax: +90 2122856545

Received 1 September 2014; Accepted 16 February 2015

**ABSTRACT**

Even though nanofiber membranes have wide unique characteristics, such as high surface porosity, high flux ratios, and lower production costs, they still show some shortcomings in terms of irreversible clogging, large pore sizes, and nanofiber rupture during filtration. This paper addresses a study to overcome such limitations with simultaneous electrospinning technique. Two different types of nanofibers were collected on the same layer. Polyacrylonitrile (PAN) nanofiber membranes have lower pore size than polysulfone (PSU) nanofiber membranes, while PSU component allowed easier toughening since it requires lower temperature for mechanical improvement against fiber rupture. As a result, pore size of simultaneous nanofiber membranes was provided by PAN (around 0.8 \( \mu \)m), whereas heat treatment at 185°C improved the strength of nanofiber membranes against rupture during filtration. Wastewater and surface water were filtered for filtration characterization. For both, removal rates were great. Thermal treatment improved membranes against fiber rupture. While fibers of heat-treated membrane were not broken, non-heat-treated membranes’ fibers were broken and membrane disintegrated. But significant irreversible fouling was observed in wastewater filtration.

**Keywords:** Simultaneous electrospinning; Polyacrylonitrile; Polysulfone; Nanofiber; Heat treatment

*Corresponding author.

1944-3994/1944-3986 © 2015 Balaban Desalination Publications. All rights reserved.