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SEM Analysis of Composite Cellulose Acetate Membranes for Separation Operations

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INTRODUCTION

Polymeric composite membranes are used widely in the separation science field. Nowadays their mechanical properties could be superior to the traditional ones. Their resistance to pressure could be higher such as its total performance in membrane operations. Recently [1] composite polysulfone membranes have been used to separate oligosaccharides from an aqueous mixture. Addition of activated carbon to polymeric material really modified bulk properties, altering pore distribution, macrovoid presence and mechanical properties [2].
Present studies demonstrate morphological variations on the development of cellulose acetate composite membranes adding activated carbon in order to be used in driven pressure membrane process.

OBJECTIVE

Study the correlation among morphological changes in the structure of cellulose acetate membranes by the addition of activated carbon using Scanning Electron Microscopy (SEM).

METHODOLOGY

Membranes were synthesized using cellulose fibers acetylated by the procedure published elsewhere [3], and commercial activated carbon (LQ, 1280 m^2/g). Carbon was meshed with a mortar and sieved to obtain particles in the range of 53-74µm. Synthesis was performed by evaporation method [4] with controlled temperature and humidity (30° C and 40% relative humidity in a chamber *Shell Lab* 9000). Membranes were cleaned in an Ultrasonic bath (Branson-2510) and treated further in a covering system (Denton Desk-II Gatan). The microscopic analysis was performed at 15 V in a Scanning Electron Microscope (JEOL, JSM 5800-LV).

RESULTS

Acetylated cellulose membrane without activated carbon is shown in Fig. 1. Analysis was performed in the SEM conditions described previously. As it can be seen this material is dense and it does not show any appreciable pore in its surface, as it was expected in commonly used reverse osmosis membranes [5].Composite membrane is shown in Fig. 2. As it can be observed, addition of activated carbon (1%) produces a symmetric membrane with homogenous pore distribution. A consequence of this phenomenon is that composite material can handle the same flow with less pressure gradient. Next step will be to test the ability of the membranes to remove ions from water.
These results demonstrate the differences among these materials and the high utility of SEM as a powerful tool in structural analysis. [6].

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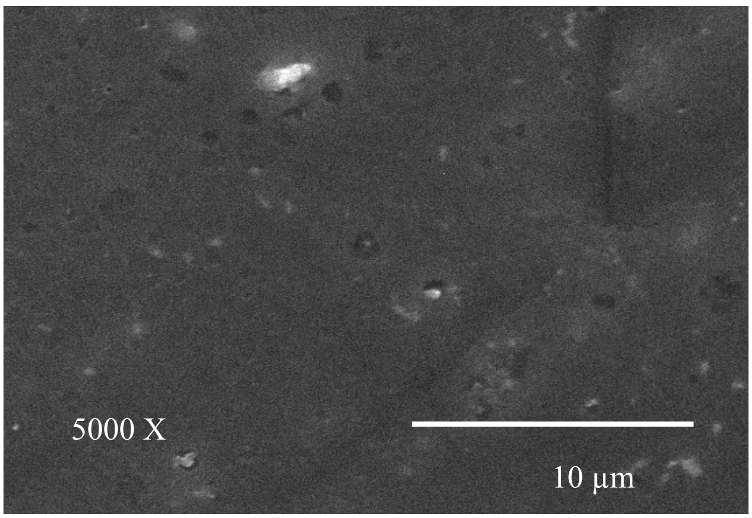

Figure 1. SEM photograph of acetylated cellulose membrane. 5000X.

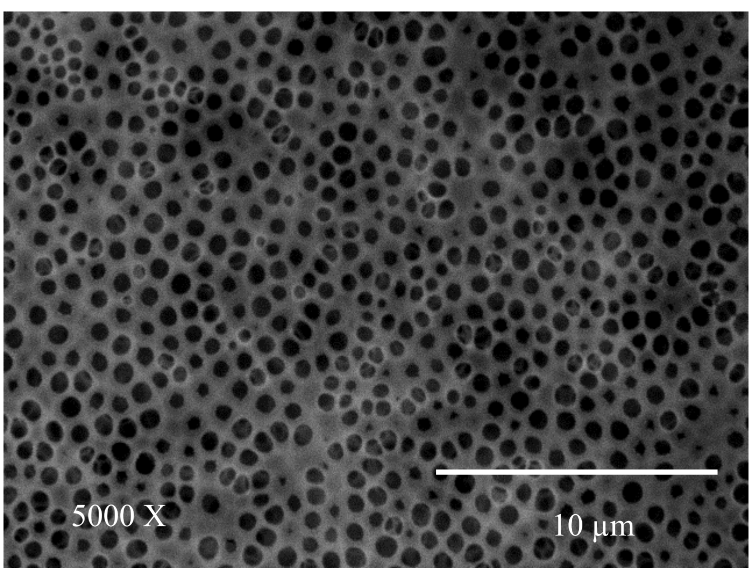

Figure 2. SEM photograph of composite acetylated cellulose membrane. 5000X.

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