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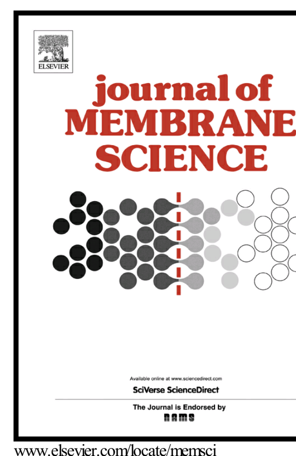

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PII: S0376-7388(15)00521-9
DOI: http://dx.doi.org/10.1016/j.memsci.2015.06.002
Reference: MEMSCI13756

To appear in: *Journal of Membrane Science*

Received date: 9 February 2015
Revised date: 31 May 2015
Accepted date: 1 June 2015

Cite this article as: Haiyan Liu, Patrick V. Gurgel and Ruben G. Carbonell Preparation and characterization of anion exchange adsorptive nonwove membranes with High protein binding capacity, *Journal of Membrane Science* http://dx.doi.org/10.1016/j.memsci.2015.06.002

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# Preparation and characterization of anion exchange adsorptive nonwoven membranes with high protein binding capacity

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**Abstract**
An anion exchange poly(butylene therephthalate) (PBT) nonwoven membrane with high protein binding capacity was developed by covalent coupling of diethylamine (DEA) to photo-induced poly(glycidyl methacrylate) (polyGMA) brushes grafted to the PBT fibers. The grafted layers were characterized using FTIR and SEM. The rates of adsorption of bovine serum albumin (BSA) to membranes with different grafted layer thicknesses (different average DEA concentrations) were determined. The static BSA binding capacities were found to be 820, 400 and 183 mg BSA/g-membrane at average DEA concentrations of 0.84, 0.35 and 0.20 mmol DEA/g-membrane respectively. These high capacities are indicative of multilayer binding of protein within the grafted layers. The larger binding capacities required longer adsorption times to reach equilibrium, indicating a diffusional resistance to mass transfer within the grafted layers. The average diffusion coefficient was determined. A column packed with anion exchange nonwoven membranes was used to separate human immunoglobulin G (hIgG) from human serum albumin (HSA). The obtained purity and yield of hIgG flowing through the column were 93.4±2% and 94.5±1.5% respectively. The purity and yield of HSA bound and eluted from the membrane were 98±1% and 94±4% respectively. The nonwoven packed column exhibited a high flow permeability ($1.1\times10^{-8}$ $cm^2$) due to high bed porosity (78%).

**Keywords**: anion exchange membrane; protein purification; nonwoven surface modification; high protein binding capacity; hIgG separation

## 1. Introduction

The high cost of many biotherapeutics is an issue of global concern. Protein therapeutic products are usually produced in complex systems such as genetically modified microorganisms, mammalian cell culture, transgenic plants, animals, as well as natural sources such as human plasma [1-5]. Because many patients need to be exposed to these therapeutic medicines for long time periods, these products must be highly pure [6], which demands

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