Superior molecular size screening and mass-transfer characterization of calcium alginate membrane

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ABSTRACT

A stable calcium alginate membrane was successfully prepared. The membrane performs a superior molecular size screening between 60 Da (urea) and 60.4 Da (Bordeaux S). The effective diffusion coefficient in the membrane was changed 2.5×10^4-fold even when our tested molecular size was only 10-fold. The pore size for mass transfer in the membrane was speculated as being mono-disperse in our experimental molecular size. The membrane has sufficient mechanical strength for conventional use in its swelled state in an aqueous phase. Its polymeric framework of calcium alginate became densely populated with increasing calcium chloride concentration, and its mechanical strength was elevated. This then dominantly influenced the mass transfer tortuosity in the membrane. The water permeation flux was linearly proportional to pressure. The mechanism of water permeation mainly exhibited a Hagen–Poiseuille flow. Pores were not observed at the surface in a scanning-electron-microscope view.

Keywords: Calcium alginate; Membrane; Mass transfer; Effective diffusion coefficient