Characterization of heterogeneous cation exchange membranes and feasibility study on the electrodialysis process

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In this study, the heterogeneous cation exchange membrane, prepared with the mixture of 40:60 for milled cation exchange resins and a polymer binder, was characterized with physicochemical and electrochemical properties and the values were compared with those of commercial cation exchange membranes. In the physicochemical properties, the water content, ion exchange capacity, and electrical resistance of heterogeneous membranes were higher than those of homogeneous membranes except the transport number. The electrochemical characterization of the heterogeneous membranes showed comparably good properties in the current-voltage relationship and the chronopotentiometry. The electrodialysis experiments were carried out to investigate the influence of the characterized properties on the process performances. The study showed that the prepared heterogeneous membrane has reasonably good properties for the applications of ion exchange membrane separation processes in terms of current efficiency, average flux as transport rate of NaCl, and power consumption to treat 1 mol of NaCl.