Preparation and applications of ion exchange membranes by radiation-induced graft copolymerization of polar monomers onto non-polar films

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Abstract

The preparation of various types of ion exchange membranes by radiation-induced graft copolymerization of polar and functional monomers onto non-polar polymeric films and fibers is reviewed. Other (non-ionic and functional) membranes prepared by the same method are also highlighted. Primary attentions are given to basic fundamentals, advantages and methods of radiation-induced graft copolymerization. The general mechanisms by which graft copolymerization reactions proceed under various irradiation conditions are described. The effects of reaction parameters on the degree of grafting in the copolymer membranes are thoroughly discussed. The performance of the membranes and its relation with the polymer structure developing during membrane preparation are also considered. A number of potential applications of the radiation grafted membranes in different fields of industrial interest are highlighted in this review. Other important applications are surveyed with attention given to fast emerging membrane processes and cells.

Although there have been a large number of membrane preparation reports and process applications in the past 50 years, the contribution of radiation grafted membranes to commercial membranes is limited. More efforts are needed to bring many experimental radiation grafted membranes to pilot scale production and to extend their applications to new fields.

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