Synthesis, Characterization and Some Properties of Chelating Polymers for Metal Ion Sorption

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Submitted in Partial Fulfillment for
the Degree of M.Sc. in Chemistry

BY

ASMAA SAYED ALI MOHAMED
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ABSTRACT

Ion-exchange membranes have been prepared by radiation induced grafting using simultaneous technique based on low cost starting material and established process technologies. Methacrylic acid (MAA) and styrene (Sty) were selected as the grafted monomers to provide two different types of functional groups. Currently; there is much on going research for developing non fluorinated polymers with better performance and lower cost as alternative ion exchange membrane materials. The polymer chosen for this study is low density polyethylene (LDPE) film of two different thicknesses (40 & 70μm). The influence of grafting conditions, i.e. the effect of total irradiation dose and comonomer concentration and compositions have been investigated. These are important parameters in correlation with the grafting yield because they can markedly influence the composition of the resulting copolymer. Once grafted, the materials were readily sulfonated using concentrated sulfuric acid or chlorosulfonic acid in dichloroethane to produce a selection of graft copolymers with performer properties.

The grafting and sulfonation of the membranes were confirmed by (FTIR) X-ray diffraction (XRD) and thermal analysis (TGA, DSC). The physicochemical properties of the prepared membranes such as, ion-exchange capacity (IEC), equilibrium swelling and electrical conductivity of the grafted membranes and their derivatives were investigated as a function of composition and degree of grafting.

The range of ion exchange capacities obtained with different degrees of grafting of MAA/Sty of composition (50/50) that sulfonated with sulfuric acid was in the range of 1.9-3.4 meq/g, whenever, for membranes that sulfonated with chlorosulfonic acid the IEC of 4.2 meq/g was achieved which is better than most of the commercially available membranes in addition to their low cost.

The possibility of practicable use of membranes in various fields, such as the removal of some heavy metal ions is investigated.

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One's work may be finished some day,

but one's education never.

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