SYNTHESIS OF FLUORINE CONTAINING FUNCTIONAL COPOLYMERS AND CATION-EXCHANGE MEMBRANES

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Copolymerization of tetrafluoroethylene (TFE) with both 1-fluorosulfonyl-difluoroacetyl fluoride ($FOC-CF_2-SO_2F$) and 2-(1-pentafluoro-2-propenyloxy)tetrafluoroethanesulphonyl fluoride ($CF_2=CFCF_2OCF_2CF_2SO_2F$) in the presence of a free radical initiator was studied. The reactions were carried out both in bulk and in solution at 30÷50°C. The copolymers were subjected to alkaline hydrolysis and the $-SO_2F$ groups content ranged within 0.20÷0.80 meq/g with copolymer yield up to 40÷45 % depending on the comonomer structure and reaction conditions. IR spectra and some basic properties of the copolymers synthesized, such as melting and decomposition temperatures etc. were also determined.

Both the simultaneous and preirradiation techniques by using ^{60}Co γ-ray source and electron beam accelerator were employed in the grafting of acrylic acid (AA) onto different types of tetrafluoroethylene-ethylene (TFE-E) copolymer films. Grafting degree within 10-70 % was obtained. The graft copolymerization was found to be diffusion-limited, with grafting process taking place on the copolymer film surface predominantly. The post-irradiation effect increased the grafting degree significantly.

The cation-exchange membranes were found to possess specific electrical resistance within 30÷500 Ω.cm and transport number 0.85÷0.88 with grafting degree 30÷50 %. They had a high thermal and chemical stability combined with good mechanical and electrochemical properties, affording their application in various electrodyalysis processes.