

Styrene grafted and subsequently sulfonated FEP film for fuel cell membrane styrene by using electron beam

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This study examined the manufacture and electrical properties of poly(tetrafluoroethylene-co-hexafluoropropylene: FEP) film modified by electron beam (EB). The irradiation methods, simultaneous irradiation and preirradiation one, were adopted for the grafting of styrene and subsequent sulfonation onto FEP film. The simultaneous irradiation with EB facilitated the homogeneous grafting, as well as a high degree of grafting with a maximum value of around 60%, thereby allowing accurate control of the degree of grafting at doses ranging from 10kGy to 100kGy. Following its subsequent sulfonation, the styrene-grafted FEP film exhibited considerably higher values of both the IEC and IC and less methanol crossover than the Nafion membrane. The ion conductivity (IC) and ion exchange capacity (IEC) values of the FEP membrane (125 μ m thick), which were dependant on the degree of grafting, were 0.25S/cm and 2.4mmol/g, respectively, at 59.2% of the degree of grafting and were superior to those of the commercialized Nafion membrane (IC, 0.12S/cm; IEC, 0.9~1.0mmol/g).