URN etd-0407109-183705-370
Author JhihYi Chen
Author's Email Address No Public.
Statistics This thesis had been viewed 48 times. Download 0 times.
Department
Year 2006
Semester 1
Degree Master
Type of Document Master's Thesis
Language zh-TW.Big5 Chinese
Title Fabrication and Morphology Study of Proton Exchange Membrane
Date of Defense 0000-00-00
Page Count 106
Keyword
PEM
sulfonation
cluster

Abstract
Many researchers has made efforts to new material exploration and old material modification for proton exchange membranes (PEMs). The aim of this study is to develop a new material via several chemical processes. PEMs made from Ultra-high molecular weight polyethylene(UHMWPE) was first grafted by styrene monomer via emulsion polymerization.The UHMWPE-g-PS membrane was then ionized by sulfonation. This research is mainly to study the morphology of the membrane.After the UHMWPE-g-PS polymer sulfonized by fuming sulphuric acid, the proton on the benzene ring of the side-chain of polystyrene is substituted by SO3H+ group .The membrane with positive-charged SO3H+ group is a polyelectrolyte. As the SO3H+ groups attract each other by ion dipoles, they become ion cluster. The concentration of reacted styrene monomer seems to affect the morphology of cluster. Fourier transform infrared spectroscopy (FTIR)was used to make sure grafting reaction occurred. The membrane is hydrophilic after sulfonation. Different water content in the membrane affects the conduction of proton. Variation of water content in the membrane is characterized by thermogravimetric analyzer (TGA) and FTIR, it evidenced the formation of cluster. Transmission electron microscopy (TEM) was used to confirm the morphology of the membrane. The relationship between the morphology and proton conductivity is characterized by impedance analyzer.
Advisory Committee Shunfa Su - advisor

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Date of Submission 2007-08-22