# PVdF-HFP - Montmorillonite composite membranes for theapplications of direct ethanol fuel cells

G.Gnana kumar · Park Ran[*] · Ae Rhan Kim[*] · Kee Suk Nahm[*,**†] · Don Jin Yoo[***]

Semi Conductor Physics Research Center of Chonbuk National university, Chonbuk National University, Jeonju 561-756, Republic of Korea

[*]Department of Hydrogen and Fuel Cells Engineering, Specialized Graduate School, Chonbuk National University, Chonju 561- 756, Republic of Korea

[**]School of Chemical Engineering and Technology, Chonbuk National University, Jeonju 561-756, Republic of Korea

[***]Department of Chemistry, Seonam University, Namwon, Republic of Korea

Montmorillonite supported PVdF-HFP composite membranes have been functionalized by irradiation technique for the applications of direct ethanol fuel cells. Structural characterizations of the fabricated membranes are examined by infra red and X-ray photo electron spectroscopy analyses. The included montmorillonite particles reduce porosity and stimulate rough nature to the membrane. Thermal stability of the irradiated membranes gets increased by the restricted polymeric segmental motion given via the montmorillonite particles. The ion exchange capacity values purely depend on the grafting degree values whereas water uptake values are influenced by the grafting degree as well as montmorrilonite particles loading. The absorbed water molecules dissociate sulfonic acid units in a greater extent and favor the ionic conductivity values irrespective of the grafting degree values. The tortuous path ways generated by montmorillonite particles distort the molecular permeation which in turn results in the lower fuel cross over. By the synergistic combination of irradiation and composite techniques, demerits of the aforementioned individual techniques have been tackled which in turn results in the extended direct ethanol fuel cell efficiencies of the fabricated fuel cell membranes and emerge its large scale applications.