

5th International Conference on

MATERIALS SCIENCE & TECHNOLOGY

April 18 -19, 2019 | Vancouver, Canada

Polyelectrolyte nanocomposite membranes using imidazole-functionalized nanosilica for fuel cell applications

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The preparation and characterization of a new type of nano composite polyelectrolyte membrane (PEM), based on DuPont TM Nafion[®] / imidazole modified nanosilica (Im-Si), for direct methanol fuel cell (DMFC) applications is described. Related to the interactions between the protonated imidazole groups, grafted on the surface of nanosilica, and negatively charged sulfonic acid groups of Nafion, new electrostatic interactions can be formed in the interface of Nafion and Im- Si which result in both lower methanol permeability and also higher proton conductivity. Physical characteristics of these manufactured nanocomposite membranes were investigated by scanning electron microscopy

(SEM), thermogravimetry analysis (TGA), differential scanning calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR), water uptake, methanol permeability and ion exchange capacity, as well as proton conductivity. The Nafion/Im-Si membranes showed higher proton conductivity, lower methanol permeability and, as a consequence, higher selectivity parameter in comparison to the neat Nafion or Nafion/silica membranes. The obtained results indicated that the Nafion/Im-Si membranes could be utilized as promising polyelectrolyte membranes for direct methanol fuel cell applications.

Biography

Elham Jafarnia has developed an early interest in international relations and interdisciplinary studies. She developed a curious mind as to with regards to international relations. Due to this, she decided to take up a course that is related to world modern-knowledge. In 2010, she received degree in Chemical Engineering from Shiraz University of Iran. She has completed MSc in Nanoscience and Nanotechnology from Sharif University of Technology. She deeply believes in cooperation because working together increase the qualification of research. She has started her group work from 2013 with the best colleagues in Iran and Egypt and they are working on environmental friendly procedure to recycle polymer wastes and nano composite membranes.

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