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Production of ion exchange membrane based polystyrene butadiene rubber for hydrogen fuel cell

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Fuel cells are of great interest in our society today due to their high efficiency and potential for low emissions. Among all the various kinds of fuel cells, Proton Exchange Membrane Fuel Cell (PEMFC) is believed to be the most promising one for transportation applications because of its fast startup and immediate response to changes in the demand for power and its tolerance to shock and vibration due to plastic materials and immobilized electrolyte. In the energy market, transportation sector is the main oil consumer, for example, in the U.S., transportation consumes about two-thirds of the nation's oil, and this figure is expected to remain essentially constant through 2020. The research is aimed at production of nanocomposite material based polystyrene-butadiene rubber for better proton conductivity and mechanical properties, in hydrogen fuel cell.

The above aim will be achieved through the following objectives:

- Optimizing the sulphonation process which is an important process used to render the polymers proton conductive by the using different sulphonating agents such us chlorosulphonic acid , acetic sulphate... etc
- Determining the effect of blending using nanomaterials (carbon nanoballs, silica or titania) on the membrane's properties (proton conductivity, mechanical properties, permeability).
- Determining the effect of hydrogenation of the rubber on the membrane properties.

Preliminary results revealed that sulphonation process can be optimized by increasing the time of reaction and concentration of sulphonating agents. The blending process has shown improvement in mechanical properties at low feed of nanomaterials. The hydrogenation process had also an effect on the properties of the membrane.

Biography

Alain I Mufula is a PhD student at the University of the Witwatersrand, Johannesburg/ South Africa. He is a specialist in synthesis nanocomposite applied in fuel cells.

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Applications of $Ga_{1-x}TM_xP$ in wide band gap layers to improve the efficiency of a gallium phosphide n-p photovoltaic solar cell

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Gallium phosphide semiconductors doped with transition metals shows variety of properties including optical properties; such as absorption and reflectivity. Much of efforts have been done in this paper to improve the efficiency of a gallium phosphide n-p photovoltaic solar cell. Different curves related to solar cells like power vs. voltage, current density vs. voltage and quantum efficiency vs. wavelength have been plotted to help us reach our desirable efficiency. We concluded that by varying atomic number of transition metals, the efficiency of solar cells increases. Under global AM 1.5 conditions, without an anti-reflective coating, the cell structure had an open-circuit voltage of 1.73 V, a short-circuit current density of 1.32 mA/cm^2 and a fill factor of 91%, corresponding to a total area conversion efficiency of 2.13%.

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