VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama" Belagavi – 590 010

PROJECT REPORT ON

"PERFORMANCE IMPROVEMENT OF DIRECT MENTHANOL FUEL CELLS USING MODIFIED NAFION MEMBRANE"

Submitted in partial fulfillment of the requirements for the award of degree

BACHELOR OF ENGINEERING
IN
ELECTRONICS & COMMUNICATION ENGINEERING

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CERTIFICATE

*Certified that the project work entitled "***PERFORMANCE IMPROVEMENT OF DIRECT MENTHANOL FUEL CELLS USING MODIFIED NAFION MEMBRANE***" is a bona fide work carried out by*

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in partial fulfillment for the award of BACHELOR OF ENGINEERING in **ELECTRONICS & COMMUNICATION ENGINEERING** of the **VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI** during the year 2018–2019. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the Bachelor of Engineering Degree.

D.V. 06/05/19	D.V. 06/05/19.	
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ABSTRACT

The Direct Methanol Fuel Cells (DMFC) is a subcategory of Proton Exchange Membrane Fuel Cells (PEMFCs) in which methanol is used as a fuel. PEMs are important components of fuel cells which conduct protons. In this paper the proposed work provides to use methanol as fuel to realize DMFC. The Membrane Electrode Assembly (MEA) of DMFC is sandwiched between two silicon chips with micro channels consists of a micro-porous Gas Diffusion Layer (GDL) layer which regulates the flow of methanol to the catalyst at the anode, a high efficiency catalyst layer for the generation of protons (H+) and electrons (e^-) from methanol, a high proton conductance membrane layer for the transfer of protons and a high efficiency catalyst at the cathode for the conversion of oxygen and H+ into water. In modern cells, electrolytes based on proton conducting polymers i.e., electrolyte membranes (e.g., Nafion) are often used, since these cells can be operated under high temperature and pressure.

A 3D DMFC model has been used to analyze the effect of nafion membrane thickness and GDL thickness on the performance in a single fuel cell. At 25°C, the fuel cell has the optimal relative humidity in the PEM, which allows proton to travel from anode to cathode of DMFC. Nafion 117 was coated with various thicknesses of Poly Vinylidene Fluoride (PVDF) polymer and its effect on fuel cell performance was studied. The power density of DMFC PVDF coated Nafion 117 higher than that of native Nafion 117 because, the coating, introduces hydrophobic surface on Nafion 117 and hence, methanol is repelled from nafion surface thereby causing reduction in methanol crossover, which gives better performance when compared to uncoated Nafion 117.The DMFC has lot of advantages, such as low energy consumption, high energy density, simple system, which is easy to carry, storage and supply. The improvement of comprehensive characteristics of proton exchange membrane represents one of the most critical challenges for the large scale commercialization of PEM fuel cells.