

In-Situ Humidity Measurement of Hydrogen Fuel Cell Car Using MEMS Sensor

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ABSTRACT-

In today's world, with increasing price of fuels, depletion of natural resources and pollution levels mounting up, an eco friendly and cheap alternative fuel in automobiles can be implemented. A hydrogen fuel cell makes it possible by converting the hydrogen to electricity that powers the vehicle. The proposed green fuel is hydrogen which is combined with oxygen inside the fuel cell. The by product is water which can be used for purposes like irrigation, domestic and industrial uses after treatment. The fuel cell efficiency is dependent on its moisture content and so a MEMS based humidity sensor is proposed ensuring the humidity.

KEY WORDS: Fuel cell, MEMS, humidity, COMSOL

1. INTRODUCTION

A hydrogen hybrid car is one which does not require any fuel source like petrol, diesel, CNG, LPG or any such non-renewable resources to run. The basic working of the carries is such that the hydrogen is the simplest and the most abundant element in the universe. Although the cars are related to more a kind of science fiction but the fact that hydrogen has been used to render and generate many energy resources. With steam up coming out of the exhausts as a replacement for the foul smelling gases it is the ideal fuel.

An atom of the H^+ consists of an electron and a proton. The fuel cell which generates the electricity can strip an electron from the protons and the electrons to generate a pure stream of electricity. The ionized H^+ atoms combine with oxygen to form H_2O . The new product of the process is heat, so this water generally takes the structure of steam. The fact that the kind of resources can be utilized to the fullest and used on such scale that each of the natural resources on earth can be utilized properly and can also be balanced leading to its use in future generations

Working: The hydrogen fuel cell operates parallel to the array. It consists of two electrodes, one is anode and the other is cathode, which is separated by a membrane. Oxygen which it passes over one electrode and hydrogen passes over to the other electrode.

Thus the car is powered by an electrical engine with electricity being produced on-board only. The fuel cell is coupled to a hydrogen tank, a battery and also to an inverter. When the engine is started or driven in city the electrical engine is powered by the battery, then the fuel cells start producing on board electricity with hydrogen. A big advantage during this process is that the battery will also recharge the fuel cell.

When more power is required the car draws electricity simultaneously from both fuel cell and battery. Energy improved during braking is changed into electricity with the help of the inverter and is given to recharge the battery. The hydrogen powered car's performance is equivalent to that of a normal fuel cell car. 5 kg of hydrogen at 700.

Design of micro humidity sensor: Water is an important by product of a fuel cell, its moisture content must be taken care of, in order to improve its efficiency. Conventional methods use humidity probes which are externally mounted to measure the humidity content at the inlet and the outlet of the fuel cell. The difference in the levels of humidity is utilized to calculate the relative humidity (%RH). The proposed method is to implement a micro humidity sensor inside the fuel cell and thereby get an accurate and continuous measure of %RH.

The humidity is measured using capacitive principle and the capacitance can also be converted in to a voltage output. The humidity sensor is bar pressure is enough to run the car to about 500 kilometers and we know that it is silent and non-polluting as it only gives out water and unused gas.

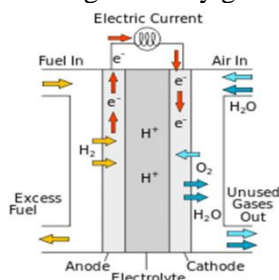


Figure.1. Working of a fuel cell

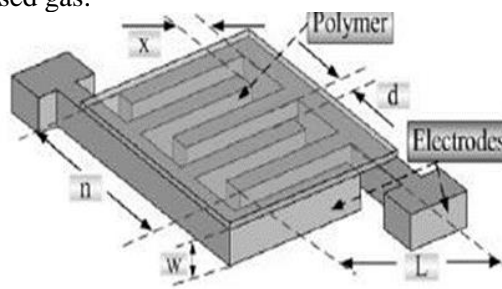


Figure.2. The structure of humidity sensor with interdigitated electrodes

A thin film of polyimide is coated on the Si substrate and the electrode assembly is carefully places inside the fuel cell chamber. When the polyimide material absorbs the moisture, it swells and the dielectric stable will rise

with environmental humidity.

Distribution infra- structure: H₂ pump can be consolidated with offered corner stores, at first look they seem more the same as common pumps. Since the hydrogen utilized as a compacted gas, filling the tank is not only a material of setting a spout in the petrol-tank cavity. As a swap for, a tight seal has been set up between the spout and auto, and powerful pumps need to drive hydrogen through the spout until the most needed weight is come to. By and by, the present era hydrogen pumps are as of now simple and safe sufficient for a normal customer to utilize.

2. CONCLUSION

The MEMS based sensor is more accurate and convenient to measure the moisture content when compared to conventional counter parts because of the following reasons: in situ measurement, improved sensitivity, better reliability and stability.

The following factors have to be considered as precautionary measures in order to have an effective humidity measurement: Packaging and lead wire connections.

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