PKL electricity- A new idea on Zn/Cu based electrochemical cell

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Abstract

A PKL module has been designed and fabricated in this article, which is Zn/Cu based. The PKL extract was used as an electrolyte for this module. It has been studied the open circuit voltage, short circuit current, maximum power, load power and internal resistance. The maximum open circuit voltage was 4.8 volt and the minimum open circuit voltage was 3.6 volt. So that the difference was 1 volt. The maximum load voltage was 2.7 volt and the minimum load voltage was 2.5 volt. So that the difference was 0.20 volt. The maximum short circuit current was 1.4 mA and the minimum short circuit current was 1.00 mA. So that the difference was 0.40 mA. The maximum load current was 1.3 mA and the minimum load current was0.80 mA. So that the difference was 0.50 mA. The maximum power was 6.6 mW and the minimum power was 4.0 mW. So that the difference was 2.6 mW. The maximum load power was 3.5 mW and the minimum load power was 2 mW. So that the difference was 1.5 mW. The maximuminternal resistance was 4.1 ohm and the minimum internal resistance was 3 ohm. So that the difference was 1.1 ohm. This work may be the guide line for practical utilization of PKL electricity.

I. Introduction

It has been conducted on PKL electricity for Zn/Cu electrodes previously for different designed and fabrications. This time it has been studied for different designed and fabrications. A falcon tube has been used for making a unit Zn/Cu based electrochemical cell. Similarly, 4 unit cell has been used for making a module. The 4 falcon tube based module was set-up in a Plastic Pot. A LED bulb was used as a load. Different parameters have been studied for practical Utilizations in the un electrified areas of Bangladesh.

Key words: Zn/Cu electrodes, PKL extract, Electricity, Internal resistance, LED lamp, Electrochemical Cell

II. Methodology:

Fig.1 Growth of Pathor Kuchi Leaf (PKL) on hard Paper

PKL is a Miracle leaf. It can grow everywhere. Fig.1 shows that it is growing on the hard paper. This PKL is becoming the PKL extract which is using as an electrolyte in the PKL electrochemical cell.

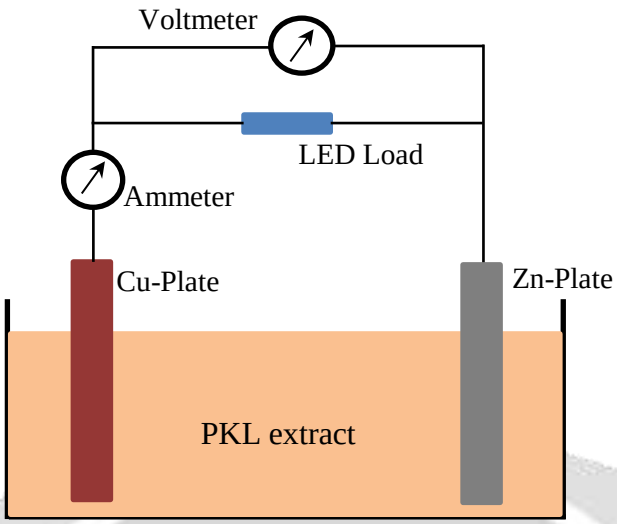

Fig.2 Experimental set-up of the basic principle of Zn/Cu based PKL electrochemical cell

Fig.2 shows the experimental set-up of the basic principle of Zn/Cu based PKL electrochemical cell. Here Cu-plate acts as a cathode and Zn-plate acts as an anode. PKL (Pathor Kuchi Leaf) acts as an electrolyte.

Fig.3 PKL light using PKL extract

Fig.3 shows the PKL lamp where Zn and Cu has been used as an electrodes and PKL extract has been used as an electrolyte. There are 4 unit cells which is constitute by a Cu plate as an cathode and Zn Plate an anode.

III. Results and discussions

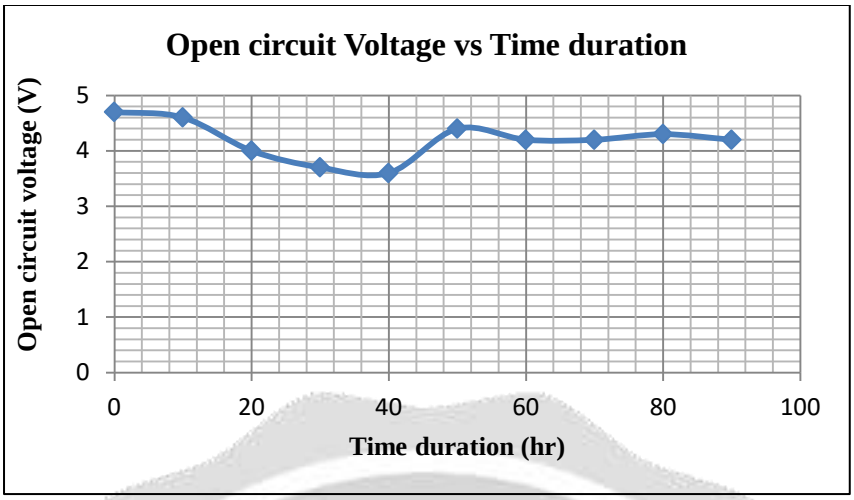

Fig.4 Open circuit Voltage vs Time duration curve

Fig. 4 shows the variation of open circuit Voltage vs Time duration curve. It is shown that the open circuit voltage decreases slightly up to 40 hrs and then it increase exponentially up to 60 hours and finally it was almost constant up to 90 hrs.

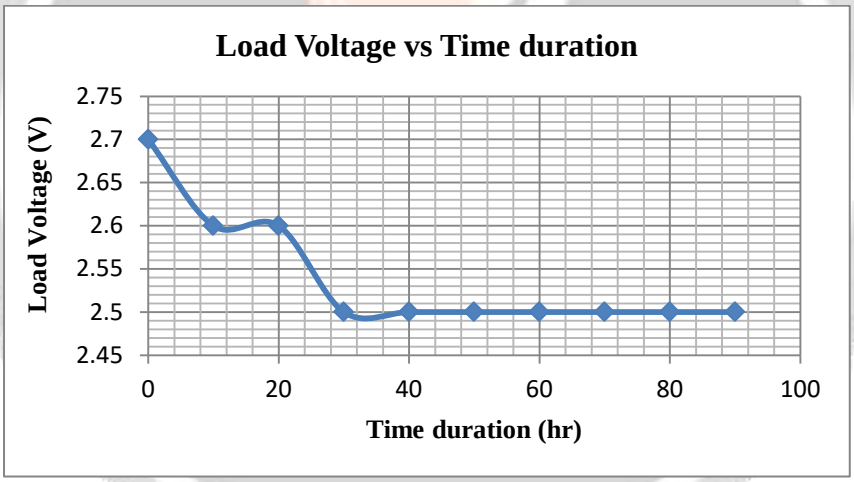

Fig.5 Load Voltage vs Time duration curve

Fig. 5 shows the variation of open Load Voltage vs Time duration curve. It is shown that the load voltage decreases linearly directly up to 10 hrs and then it increase exponentially up to 30 hours and finally it was almost constant up to 90 hrs.

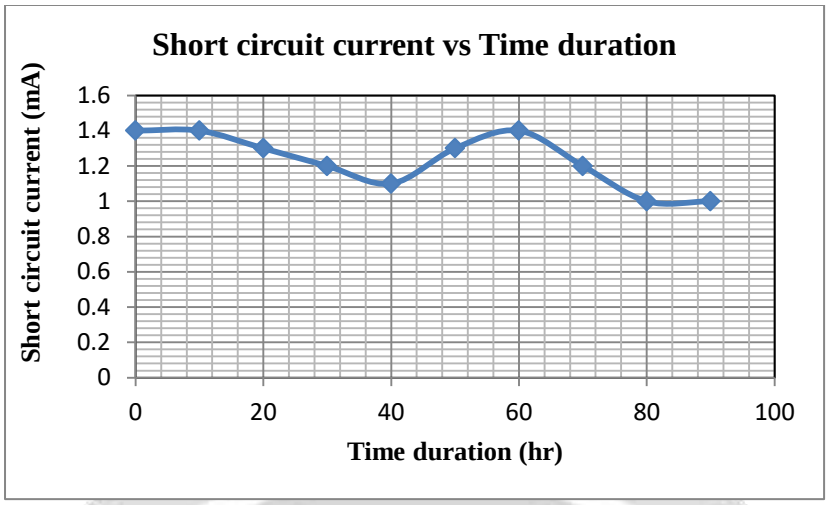

Fig.6 Short Circuit Current vs Time duration curve

Fig. 6 shows the variation of Short Circuit Current (mA) vs Time duration (hr) curve. It is shown that the Short circuit current (mA) decreases linearly directly up to 40 hrs and then it increase exponentially up to 80 hours and finally it was almost constant up to 90 hrs.

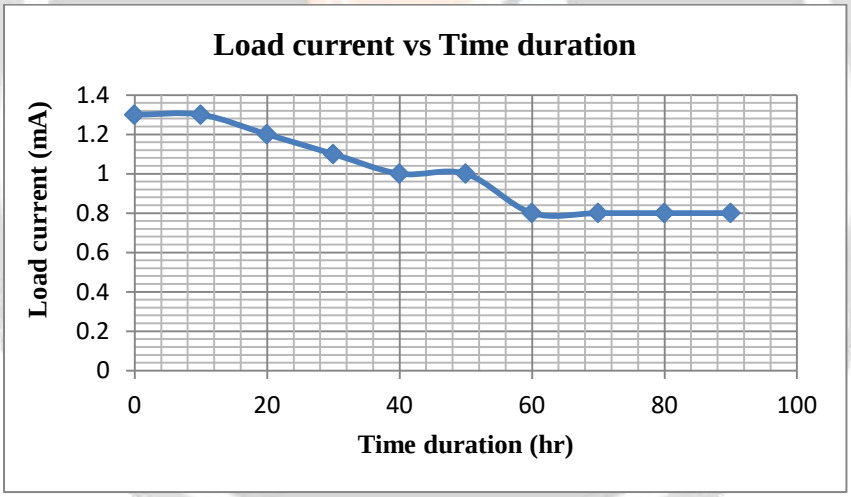

Fig.7 Load Current vs Time duration curve

Fig. 7 shows the variation of load current (mA) vs Time duration (hr) curve. It is shown that the Short circuit current (mA) decreases linearly directly up to 40 hrs and then it increase exponentially up to 60 hours and finally it was almost constant up to 90 hrs.

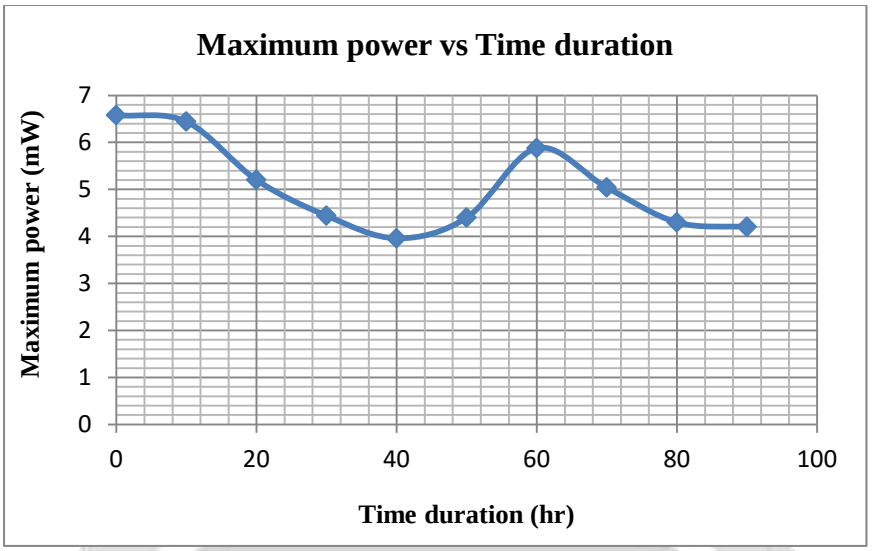

Fig.8 Short Maximum Power vs Time duration curve

Fig. 8 shows the variation of maximum power (mW) vs Time duration (hr) curve. It is shown that the maximum power (mW) decreases linearly directly up to 10 hrs and then it decreases exponentially up to 60 hours and finally it decreases up to 90 hrs.

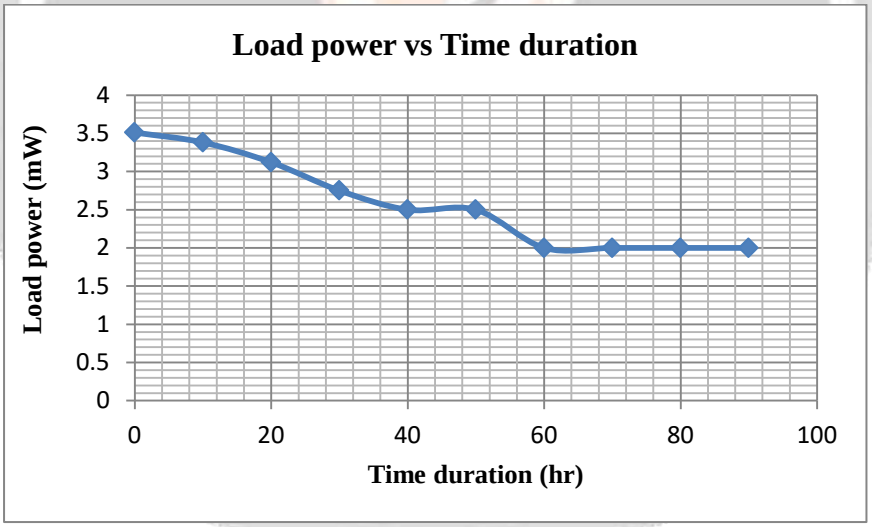

Fig.9 Load Power vs Time duration curve

Fig. 9 shows the variation of load power (mW) vs Time duration (hr) curve. It is shown that the load power (mW) decreases linearly directly up to 40 hrs and then it increases exponentially up to 60 hours and finally it was almost constant up to 90 hrs.

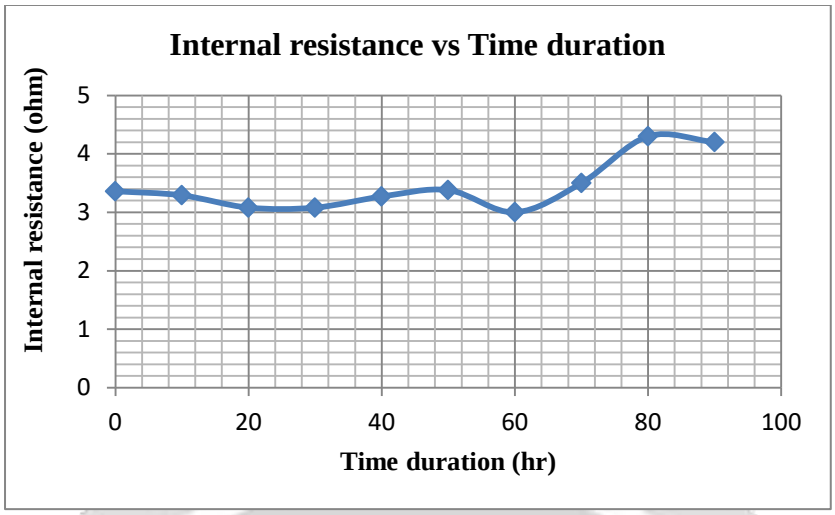

Fig.10 Internal Resistance vs Time duration curve

Fig.10 shows the variation of internal resistance (ohm) vs Time duration (hr) curve. It is shown that the internal resistance (ohm) decreases linearly directly up to 30 hrs and then it increases exponentially up to 60 hours and then it increases up to 80 hrs and finally it was almost constant up to 90 hrs.

IV. Conclusions

The study was for 90 hrs. The internal resistance was almost constant up to 70 hrs and it was slightly increased up to 90 hrs. The aim of the further work should be the maintaining the constant level of the internal resistance. The difference of the maximum and minimum internal resistance was 1.1 ohm which was slightly high. It should be low in further work.

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