

AgNPs for Power Production

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Abstract

A study on PKL electrochemical cell has been conducted using AgNPs. The electrochemical cell was made by PKL electrolyte and Zinc & Copper plates as electrodes. The quantity of electrolyte was 50 ml and the electrodes were Zinc and Copper plate. The zinc plate was as an anode and copper plate was as a cathode. The 50 ml electrolyte was prepared by 24 ml PKL extract + 24 ml tap water + 2 ml liquid AgNPs (PKL:water: AgNPs = 24:24:2). It is shown that the open circuit voltage, load voltage, short circuit current and load current was almost sustainable. The study period was 23300 minutes = 388 hrs = 16 days. The results of this work may help to use the electricity in near future.

Keywords: AgNPs, open circuit voltage, load voltage, short circuit current, load current, Electrochemical cell

I. Introduction

At present NPs are very important for various sectors in various purposes[1-50]. To keep it in mind we have conducted research on AgNPs[51-99]. We have synthesized AgNPs using PKL extract as a reducing agent[100-139]. The scientific name of the PKL is *Bryophillum Pinnatum*[141-150]. PKL is the local name in Bangladesh[151-160]. It grows every where. There are a lot of vernacular name of the PKL. The PKL tree grows from the PKL(Pathor Kuchi Leaf). We designed and developed a PKL electrochemical cell[161-180]. The PKL electrochemical cell acts on the principle of Galvanic or Voltaic cell. But there are a little difference of our designed and fabricated PKL electrochemical cell from Galvanic or, Voltaic cell[181-199]. That is why our designed and fabricated PKL cell is called modified Voltaic or, modified Galvanic cell[200-210]. In our modified voltaic cell we did not use any salt bridge[211-218]. As a result internal resistance of the cell has been decreased[219-220]. The performance of the cell has been increased automatically[221-223]. This work may be the guide line to use PKL electricity across the world.

II. Methodology

The methods and materials have been given by the following:



Fig.1 Experintal set up of the AgNPs based electrochemical cell

Electrodes: Zinc plate used as an anode and the copper plate used as a cathode.

Electrolyte: AgNPs, PKL extract and tap water have used as an electrolyte. The quantity of AgNPs was 2 ml, the PKL extract was 24 ml and the tap water was 24 ml in each cell. There are 6 cells in a battery box. The zinc and copper plates were immersed in to the electrolight in a battaery box shown in Fig.1.

Battery box: The battery box was made by plastic containing 6 boxes. The unit cell was made using each cell. In each cell there was a copper plate and a zinc plate shown in Fig.1.

Connecting wire: The copper wire was made as a connecting wire. It is needed connecting wire to make the series and parallel combination shown in Fig.1.

Load: The LED(Light Emmiting Diode) has been used as a load shown in Fig.1.

III. Results and Discussion

The summery of the data has been given in Table 1. After taking the values of open circuit voltage, load voltage, short circuit current and load current by a callibrated multimeter, it has been collected and tabulated in Table 1.

Table 1: Table for data collection using AgNPs

Time duration(min)	Open Circuit Voltage, V_{oc} (V)	Load Voltage, V_L (V)	Short Circuit Current, I_{sc} (mA)	Load Current, I_L (mA)
00	0.98	0.95	4.14	3.12
140	0.99	0.94	3.98	2.97
180	0.99	0.94	3.89	2.87
260	0.99	0.94	3.83	2.82
360	0.99	0.93	3.76	2.75
1440	0.98	0.93	3.53	2.52
1500	0.98	0.92	3.52	2.50
2940	0.98	0.92	3.44	2.43
3240	0.98	0.92	3.41	2.40
4380	0.97	0.91	3.37	2.36
5820	0.97	0.90	3.29	2.28
6960	0.97	0.90	3.26	2.25
7060	0.95	0.89	3.24	2.23
7540	0.94	0.89	3.23	2.22
8260	0.88	0.86	3.19	2.18
8990	0.88		3.22	2.21
9230	0.87	0.83	3.23	2.21
9840	0.85	0.82	3.25	2.23
10560	0.81	0.80	3.24	2.22
11280	0.82	0.80	3.23	2.21
12000	0.81	0.79	3.20	2.19
13440	0.80	0.80	3.17	2.16
13800	0.89	0.83	3.16	2.14
15240	0.93	0.90	3.14	2.13
16000	0.93	0.90	3.13	2.11
17400	0.93	0.90	3.10	2.08
18900	0.92	0.90	3.01	2.00
20000	0.87	0.85	2.73	1.70
23300	0.85	0.81	2.42	1.41

Table 1 shows the collected data for a PKL electrochemical cell using AgNPs. The data was collected by calibrated multimetr. The time duration was measured by stop watch.

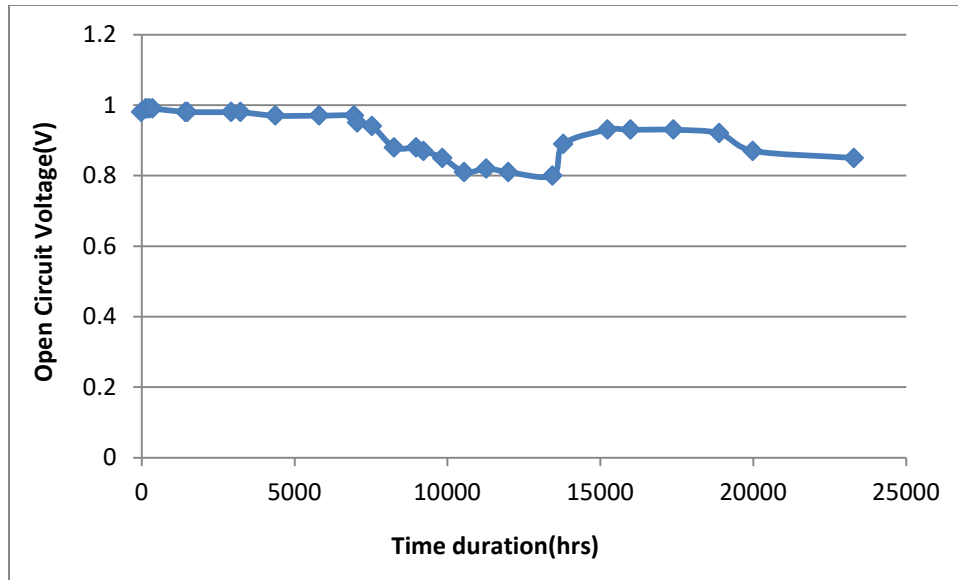


Fig.2 Open Circuit Voltage versus Time duration curve

Fig.2 shows the variation of open circuit voltage with the variation of time duration(hrs). It is shown that the open circuit voltage was almost constant up to 8000 minutes and then it decreases up to 15000 minutes. Then after it increases exponentially up to 20000 minutes and then finally it decreases slightly upto 23300 minutes.

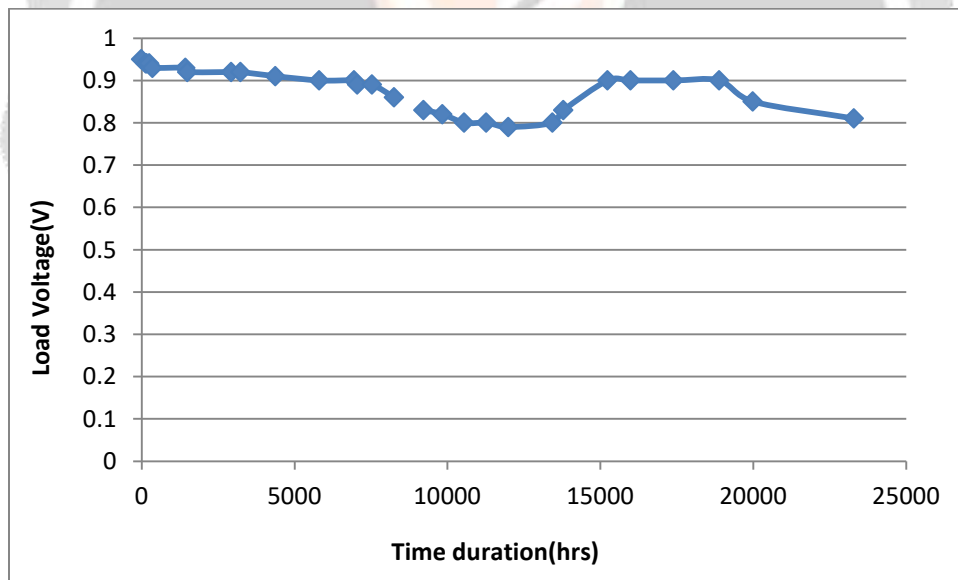


Fig.3 Load Voltage versus Time duration curve

Fig.3 shows the variation of load voltage with the variation of time duration(hrs). It is shown that the load voltage was almost constant up to 7000 minutes and then it decreases up to 14000 minutes. Then after it increases exponentially up to 20000 minutes and then finally it decreases slightly upto 23300 minutes.

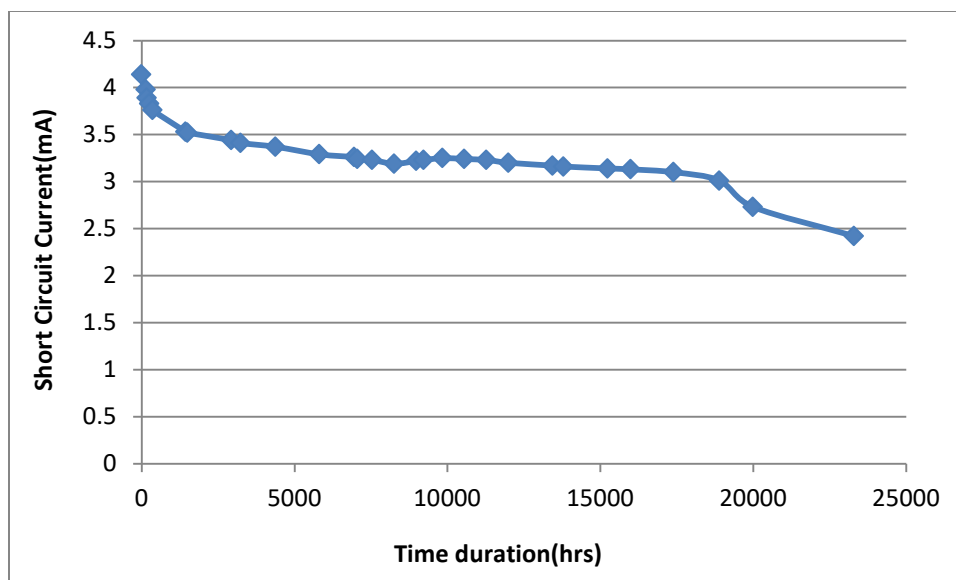


Fig.4 Short Circuit Current versus Time duration curve

Fig.4 shows the variation of short circuit current with the variation of time duration (hrs). It is shown that the short circuit current decreases exponentially up to 20000 minutes and then finally it decreases upto 23300 minutes.

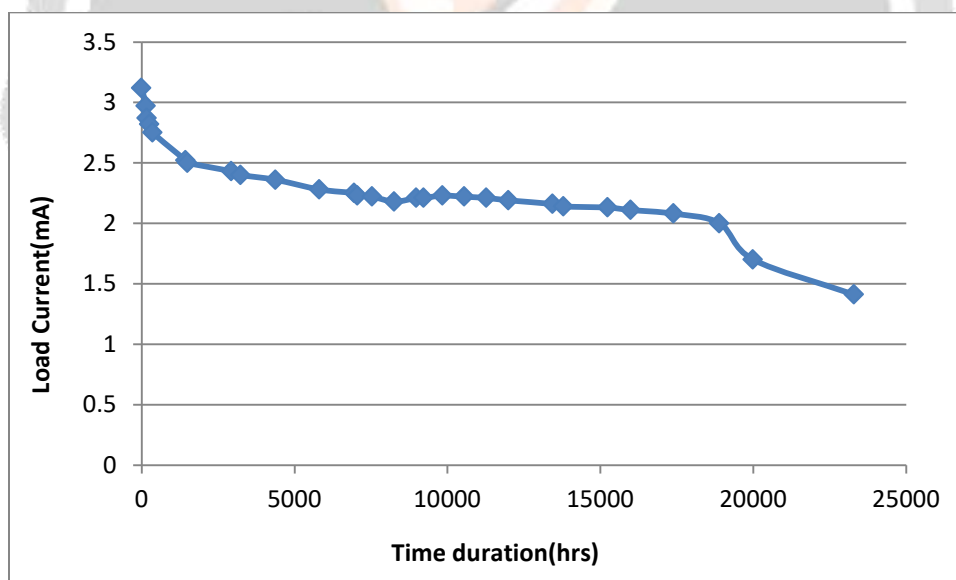


Fig.5 Load Current versus Time duration curve

Fig.5 shows the variation of load current with the variation of time duration (hrs). It is shown that the load current decreases exponentially up to 20000 minutes and then finally it decreases upto 23300 minutes.

IV. Conclusions

It has been recorded the value of open circuit voltage, load voltage, short circuit current and load current for 23300 minutes = 388 hrs = 16 days. But the results did not change significantly. So that it can be concluded that AgNPs is feasible and viable for PKL electrochemical cell.

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