

# Utilization of Green Electricity for Operation of Miniature Electronic Circuits

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## ABSTRACT

On small scale basis, green electricity generation from trees or plants is possible. Almost all kind of the leaf contains trillions of plant cells. Throughout the process of photosynthesis, each cell of the leaf emits plenty of electrons. By the movement of these electrons, one can produce electricity called green electricity. In our day-to-day life, electric energy is playing a major and indispensable role for human being. Most all the fields are encompassed with electricity and related appliances. Also, there are number of ways by which electricity is being generated. To prevail the demand of electrical energy is ever growing problem and is creating several threats to the environment. To deal with the situation, various types of non-conventional and renewable energy sources are being invented and developed all over the world.

In this research paper, an influence is given to utilize the generated DC voltage from living plants like xerophytes and mesophytes. This kind of energy source is non-conventional as well as renewable energy source and is very useful. It is eco-friendly technique of low voltage generation and its utilization. The undertook research work describes the design aspect of low voltage energy source wherein various plants are used as natural electrolytes along with various electrodes and cells to operate miniature electronic circuits.

**Keywords:** Miniature circuit, Green electricity, eco-friendly, renewable source, electrodes and cells

## I. INTRODUCTION

Now a day there are number of ways by which electricity is being generated. The conventional as well as non-conventional methods are being research and developed used by different agencies, boards and institutes. Everywhere scientific teams are contributing their shares in the field of electricity generation. The researcher is trying to introduce nonconventional method of generation of electricity by using living plants like xerophytes and mesophytes. After successful generation, it may be utilized as a new kind of power source for small electronic circuits, devices & gadgets. This may treat as one of the renewable emerging source of energy. Such type of low voltage can be generated without polluting any environmental parameters.

In the presented research work, a small amount of voltage was generated and utilized for actual working of few miniature electronic circuits and gadgets. By using the electrode pairs or cells in series combinations, the net output voltage was increased whereas by using parallel combinations, the net output current was increased. Thus, various miniature electronic circuits and gadgets can be operated by the virtue of this generated output

voltage. These circuits include Digital watch, LED circuit, 12 and ½ digit Calculator, Musical sound circuit, Quartz wall clock, Timer IC 555 circuit, Tiny DC motor, Small toy, Remotes of CD player, Tiny torch and Joule Thief circuit. Most of these miniature electronic circuits require 1.5 to 4.5V DC voltage with few milliamperes (mA) of current. Also, the simultaneous operation of few of above mentioned circuits were tested using such type of generated voltage from living plants. Few photographs and video clips of actual operation of the above miniature electronic circuits and gadgets are recorded locally and stored in the research laboratory as well as college center.

## II. UTILIZATION OF GENERATED VOLTAGE FOR WORKING OF DIGITAL WATCH

Digital wrist watch (Model: Mint Silicone Strap -105 DDK) with liquid crystal display (LCD) requires the typical operating voltage of 1.5 volts and current of approximately 2.5 mA. Such the low values of the voltage and currents were produced by using series combination of the Ag-Zn or Cu-Zn or any suitable type of electrodes or cells. Following figure (1) shows the actual working of a digital wrist watch using such type of generated voltage from the living plants. The digital watch and other circuit components were assembled on a regular breadboard with the help of bus and terminal streams. The watch worked for next many days and months using such kind of generated voltage. Time setting, day-date settings and all other available functions worked in the proper manner.

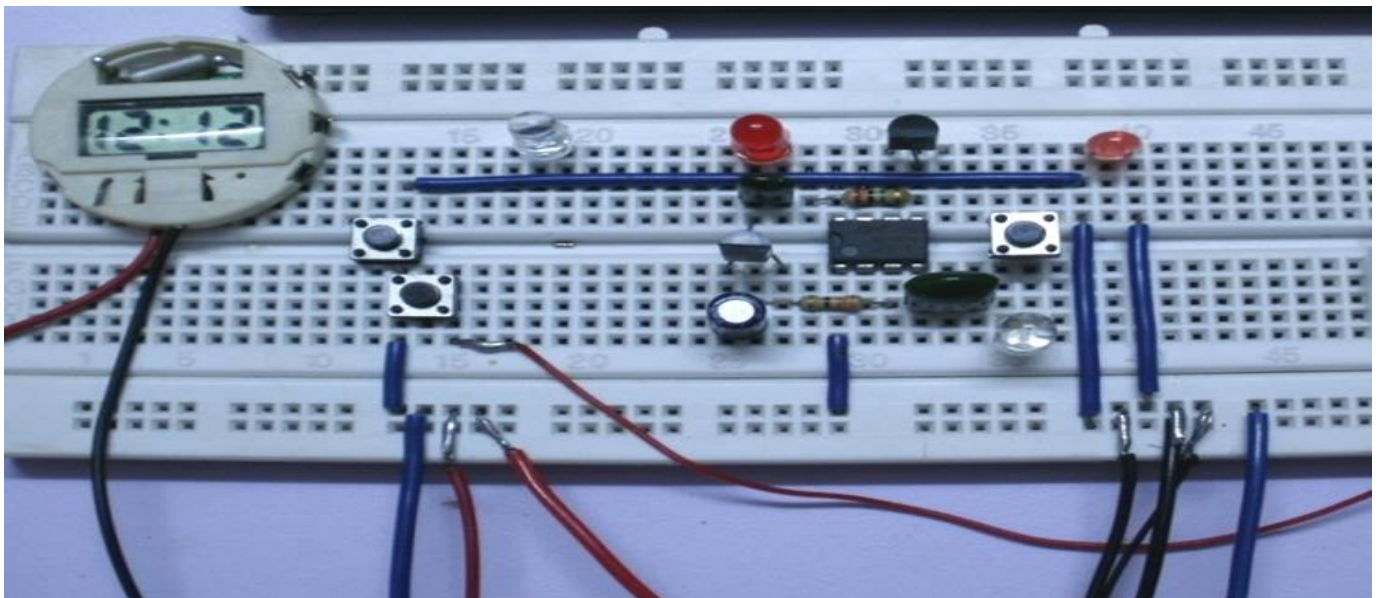


Figure (1) : Actual working of Digital Watch

## III. UTILIZATION OF GENERATED VOLTAGE FOR WORKING OF LIGHT EMITTING DIODE

As per the requirement, various types of Light Emitting Diodes (LEDs) are available in the electronic market. The main types of LED are miniature, high power devices and custom designs such as alphanumeric or multi color device. A regular low current LED of 5mm size requires the typical operating voltage of 2 volts and current of 2.5 mA (approximately 5 mW consumption). Such values of the voltage and currents were produced by using series and parallel combination of the Ag-Zn or Cu-Zn or any suitable type of the electrodes or cells. Following figure (2) shows the actual working of such a regular low current Light Emitting Diode (LED) using

generated voltage from the living plants. In the given figure, LED circuit is arranged on a regular breadboard, along with few other components. In order to focus on the emitted light from the LED, the photograph was intentionally snapped in darkness.

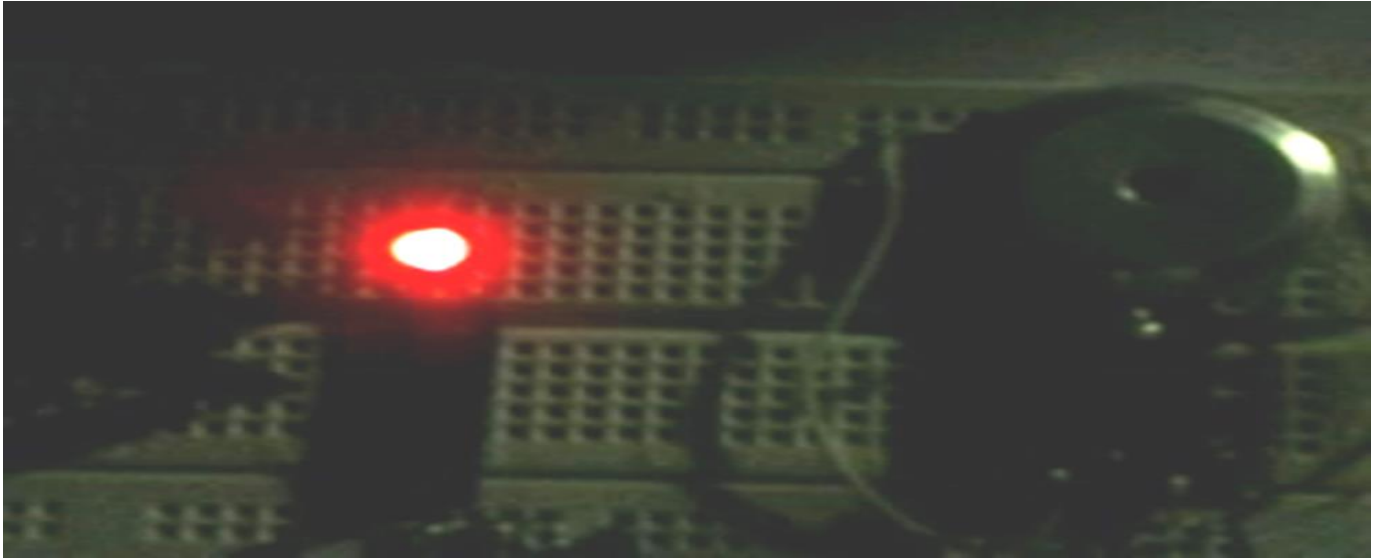


Figure (2) : Actual working of LED Circuit

#### IV. UTILIZATION OF GENERATED VOLTAGE FOR WORKING OF 12 AND ½ DIGIT CALCULATOR

A digital calculator with 12 and ½ digits (Model: CITIZEN – CT 512, Large Display) requires the typical operating voltage of 1.5 volts and current of 25 mA. By removing internal battery of the calculator, such values of the voltage and currents were produced by using series combination of the Ag-Zn, Au-Zn and Cu-Zn or any other suitable type of the electrodes and cells. Following figure (3) shows the actual working of such a calculator, using the generated voltage from living plants. All kind of available functions in the calculator like Auto checking, memory settings, auto power off and all other mathematical functions of the calculator worked in proper manner. A digital multimeter in the photograph of this figure shows the generated full load voltage of '2.10V', which is somewhat more than the actual voltage required for the working of calculator.

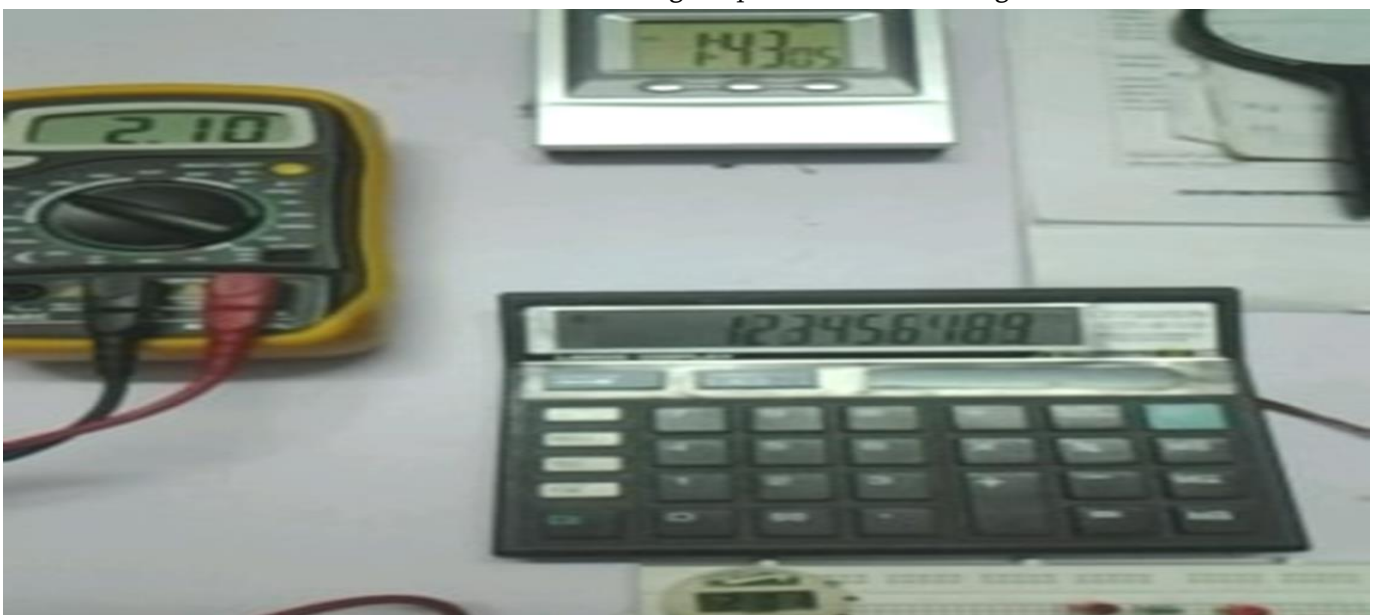


Figure (3): Actual working of 12 and ½ Digit Calculator

## V. UTILIZATION OF GENERATED VOLTAGE FOR WORKING OF MUSICAL SOUND CIRCUIT

A miniature musical sound circuit or musical greeting card circuit with built in COB (Chip On Board) and buzzer as sound output was connected as the output load. Such a circuit works on 1.5V voltage and 25mA current ratings (approximately 50 mW power consumption). The required values of voltage and currents were generated by using series and parallel combinations of the Ag-Zn, Au-Zn and Cu-Zn or any other suitable type of the electrode pairs and cells. The musical sound circuit worked properly with suitable sound output. Following figure (4) shows the actual working of such a circuit with the help of voltage generated from living plants.

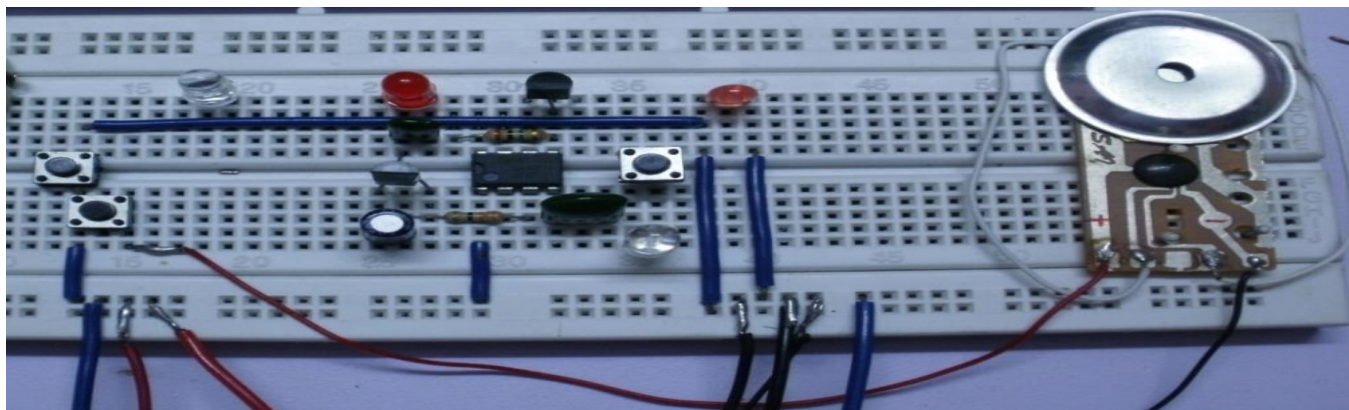


Figure (4) : Actual working of Musical sound circuit with buzzer as output load

## VI. UTILIZATION OF GENERATED VOLTAGE FOR SIMULTANEOUS WORKING OF DIGITAL WATCH, LED CIRCUIT, CALCULATOR AND MUSICAL SOUND CIRCUIT

A digital watch, a LED circuit, a digital calculator and a miniature musical sound circuit were simultaneously connected as a parallel load at the output. The simultaneous working of all these four circuits were observed and studied carefully. All the circuits worked properly as long as they were connected to the living plant setup using suitable number of electrodes and cells. Following figure (5) shows an actual photograph of simultaneous working of all these circuits, using the voltage generated from living plants. LCD display of digital watch and calculator are showing particular values of time and calculations of that instant. The voltage requirement for such a simultaneous working was up to 4.5 volts, which was developed properly.



Figure (5): Simultaneous working of Digital watch, LED circuit, Musical circuit & Calculator

## VII. CONCLUSION

It was observed that such kind of source is non-conventional, renewable and eco-friendly technique of low voltage generation and its small scale utilization. The undertaken research work describes the design aspect of low voltage energy source wherein various plants are used as natural electrolytes along with various electrodes and cells to operate miniature electronic circuits which includes Digital watch, LED circuit, 12 and ½ digit Calculator, Musical sound circuit, Quartz wall clock, Timer IC 555 circuit, Tiny DC motor, Small toy, Remotes of CD and DVD players, Tiny torch and Joule Thief circuit. Such types of sources are of low cost, replenishable, sustainable, pollution free and an emerging low power source of electricity.

The presented research work is in early stages, but further research may open novel ways of using such type of green energy. Thus craving of human being on conventional resources may reduce on some extent. So let's expect that our imagination may cross boundaries and we might be plugging into the surrounding trees and plants to charge our mobile phones and other gadgets using such type of green electricity.

## VIII. REFERENCES

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