

NUTRIENT AGAR BATTERY

Microbiology

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ABSTRACT

Various types of materials used in the battery have varied effect on the human life. Usage of acid materials, corrosive electrolytes etc., can definitely affect environment and health. In this study Nutrient agar which is a basic media in microbiology laboratory is used solely in a 2A battery. Voltage of which is checked and found that, it produces 1.22V which is approximately equal to the rechargeable basic nickel batteries. In series with commercially available 2A battery, it adds the voltage to lit a 3V electric bulb which glows brightly. Since it does not contain any toxic chemicals, if voltage can be slightly increased by further studies, this can definitely be used in button and cylindrical battery.

KEYWORDS

Nutrient Agar, Alkaline Battery

INTRODUCTION:-

Nutrient agar is the basic media which is used in the microbiology for the growth of non-fastidious microorganisms. Sodium chloride, Peptone, Yeast extract and Agar are its composition [1]. Its pH is 7.2 to 7.4. The content of this nutrient agar and its alkaline pH directed to this study where it was checked if Nutrient agar in its powder form can be used in an Alkaline battery solely. When a normal commercially available 2A battery is considered it has manganese dioxide mix inside, which is cathode mix. It is found in the studies that compounds of manganese can add to environment pollution and has various negative health effects [2]. Manganese on overexposure can lead to toxicity and there are chances of this as an occupational hazard in battery industry [3]. There is definitely a search for sustainable, environment friendly, easy availability of the content in battery. Sodium ion battery [4] and rechargeable protein battery [5] have shown that output of the battery is in a considerable range. Agar in gel form has been used in an electrochemical capacitor and has proved to be usefull. Hence, this study is an attempt to show the performance of the Nutrient agar, which contains all these substance in different ratio, in powder form and not gel form in a battery. No other additional chemicals were used.

MATERIALS AND METHOD:

MATERIALS:-

1. Nutrient agar (HiMEDIA)-Content of Nutrient agar: -Peptone 5.000gm/Litre, Sodium chloride 5.000gm/Litre, Yeast extract 1.500gm/Litre, Agar 15.000 gm/Litre. Final pH (at 25°C) 7.4±0.2
2. Carbon rod
3. Zinc can
4. Electric bulbs(3V)
5. Multimeter

METHOD:-

Step 1: -Commercially available 2A battery was taken. The voltage of this single battery was checked in a multimeter.

Step 2: -Disassembling of commercially available 2A battery was done. The cathode mix was removed, cleaned thoroughly, rest of the parts were retained.

Step3: -To the Zinc container Nutrient agar was added as the cathod mix instead of manganese dioxide mix, closed tightly with metal top (-) and metal bottom (+).

Step4: -Voltage of this only Nutrient agar containing battery was checked.

Step5: -Commercially available 2A battery and Only Nutrient agar was connected in series and voltage was checked.

Step 6: -Test with 3V electric bulb was done. First it was tested with commercially available battery. Second with the battery with only nutrient agar. Third with a series connection of 1st and 2nd type of battery. Results are showed in Table 1.

RESULTS:-

Table 1: -Voltage of batteries and observation on testing these batteries with 3V bulb.

CELL	Voltage(V)	Observations on test with 3V electric bulb
1.Commercially available 2A battery	1.62(figure 1a)	Bulb lit (glows faintly) (figure 2b)
2.Battery with nutrient agar	1.22(figure 1b)	Bulb not lit
3.Battery 1+Battery 2 in series	2.84(figure 2a)	Bulb lit (glows brightly) (figure 2b)

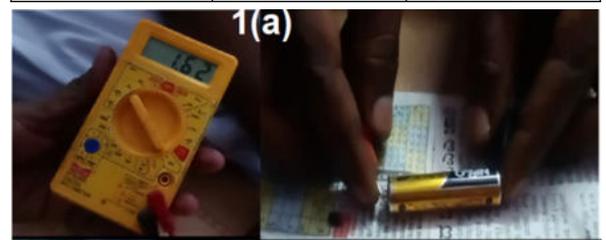


Figure 1:(a)(top) shows the voltage for commercially available 2A battery(b)(bottom)shows the voltage detected in Nutrient agar battery

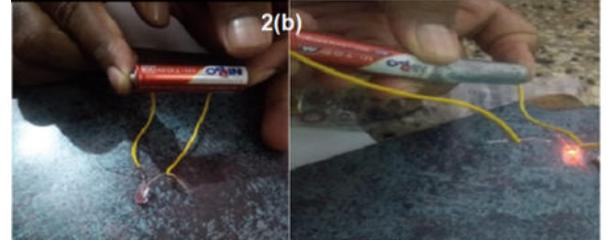
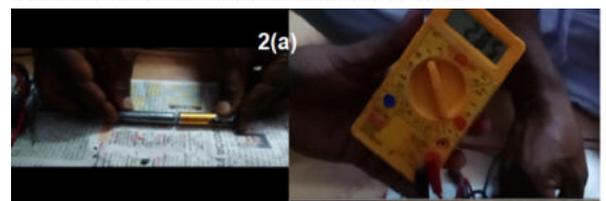


Figure 2:(a)(top) shows the increase in voltage when commercial and nutrient agar battery are held in series.(b)(bottom) shows difference in brightness of a lit 3V electric bulb.

DISCUSSION:-

When commercially available battery and Nutrient agar battery was connected in series there was voltage of 2.85V detected. Since individually also Nutrient agar battery produced 1.22V, this not just acting like a metal conductor but there is a voltage addition in series connection. Nutrient agar does not contain toxic substances. On the other hand, there are reports of ingestion of button batteries and cylindrical batteries (comparatively less common, but reports exist) especially children. These acts can have toxic damage and corrosive effects inside the body, severe esophageal injuries in children which is definitely of concern [6][7][8]. Nutrient agar battery is solely giving voltage equal to basic rechargeable batteries (Nickel metal hydride battery, Nickel cadmium battery) which is 1.2V.

CONCLUSION:-

Usage of Nutrient agar in a battery can be definitely considered. Further study needs to be conducted to address the parameters such as: -ways to increase the voltage of nutrient agar batteries, can replacement of toxic chemicals be done with this nutrient agar, in a button battery and cylindrical battery, can this nutrient agar be used to create a rechargeable battery.

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