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Temperature of Environment and Dark Electric Energy

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Abstract
The dark electric current arising from the contact of aluminum with water can be a source of electrical energy. The strength of the dark current is proportional to the ambient temperature. The dark current in a liquid in contact with two unequal aluminum electrodes flows for a very long time without noticeable attenuation. Chemical reactions of aluminum with water do not play role in creating this current.

Keywords: *Aluminum, Water, Voltage, Dark current, Resistance, Temperature*

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I. INTRODUCTION

In physics and in electronic engineering, dark current is the relatively small electric current that flows through devices even when no photons are entering the device. It consists of the charges generated in the detector when no outside radiation is entering the detector. Physically, dark current is due to the random generation of electrons and holes within the depletion region of the device [1]. If voltage applied to two electrodes of such devices, value of the dark electric is typically 10^{-7} A. The applied voltage is necessary for this type of dark current to occur. At least for this reason, it cannot be a source of electrical energy.

Two different aluminum electrodes immersed in water are also a source of dark electric current. In this case the value of dark electric current can achieve 0.1 mA without external voltage [2]. The aluminum oxide layer is too thin that particles of the metal and the water can pass through a potential energy barrier of the layer that is higher than the energy of the particles. A tunneling current therefore can flow through the contact of aluminum with water [3].

To some extent, the existence of dark current means a violation of the second law of thermodynamics. The system "environment and water in which aluminum electrodes are located" is not closed. The extraction of energy from aluminum electrodes leads to a slight decrease in the energy of water, and hence its temperature. In this case, the electromotive force must be proportional to the temperature.

Since the process of dark current formation is due to tunneling, it can also lead to violation of the second law of thermodynamics [4]. In this case, the temperature dependence of the electromotive force is relatively weak. The temperature dependence of the voltage is the result of the influence of temperature on the internal resistance of a dark current source. A detailed study of the dependence of the voltage on the load resistance allows us to approach the solution of this problem. The processes responsible for the formation of the dark current still remain unclear.

Chemical reactions occurring in one cell with two dissimilar aluminum electrodes in the liquid have nothing to do with what happens in the other. Therefore, the voltages created by two cells with aluminum electrodes immersed in a liquid should be measured simultaneously. If electrical energy is generated by the environment, this will be recorded. If these are two ordinary chemical sources, then there should be no correlation between voltages in principle. Unfortunately, these arguments are not completely unambiguous [5]. A situation is possible in which the ambient temperature affects both chemical sources of electrical energy. Almost the only way to find out is to measure the effect of temperature on the electromotive force created by a chemical source, one of the electrodes of which is aluminum. A source with two different aluminum electrodes is essentially a dark source.

II. MEASUREMENTS

The setup shown in Figure 1 enables to measure simultaneously voltages created each sources. The main part of the each source is a cell (K) filled with distilled water (L). Two cylindrical electrodes (E) and (C) with diameters 7 mm and 70 mm respectively are immersed in the water of one source. The second source contains the cylindrical electrode with diameter 7 mm and the spiral-shape electrode (S) with average diameter 70 mm and with step between wraps of 10 mm. The diameter of aluminum wire of the aluminum electrode is 4 mm.

The value of the area of the electrode (*C*) located in the liquid is equal to the lateral area of the electrode (*S*) immersed in the liquid. Voltages U_1 and U_2 on the load resistances *R* are registered simultaneously. The cells 1 and 2 are in light-proof vessels (*T*). The voltage drop across the resistor is accompanied by energy losses in the liquid. As a result, the temperature of the liquid may differ from the ambient temperature. Therefore, the third vessel with opaque walls filled with water with the same volume is intended for measuring the ambient temperature *t*. At first glance it seems that thermostats (*T*) are surplus details in this equipment. Not certainly is that way. As a mater of fact, these radiators played a role of dampers smoothing random fluctuations of temperature.

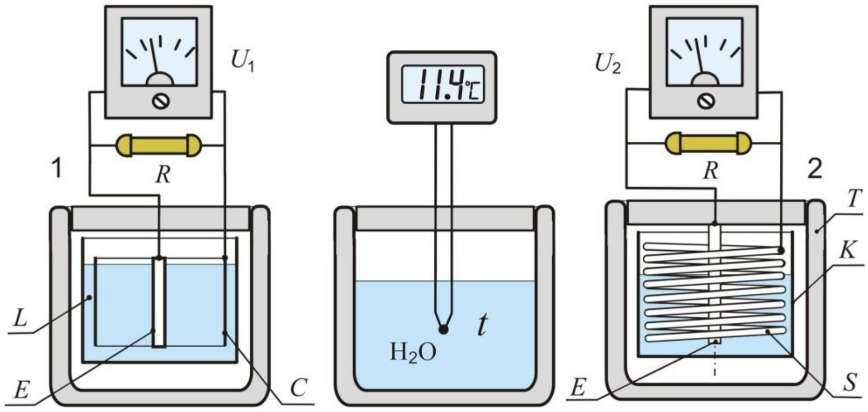

Figure 1: Two Different Dark Sources and Temperature-Sensitive Gauge

What is shown in Figure 2 means that the voltages are dependent on the external environment. An increase in the voltage created by one source is accompanied by an increase in the voltage in other source.

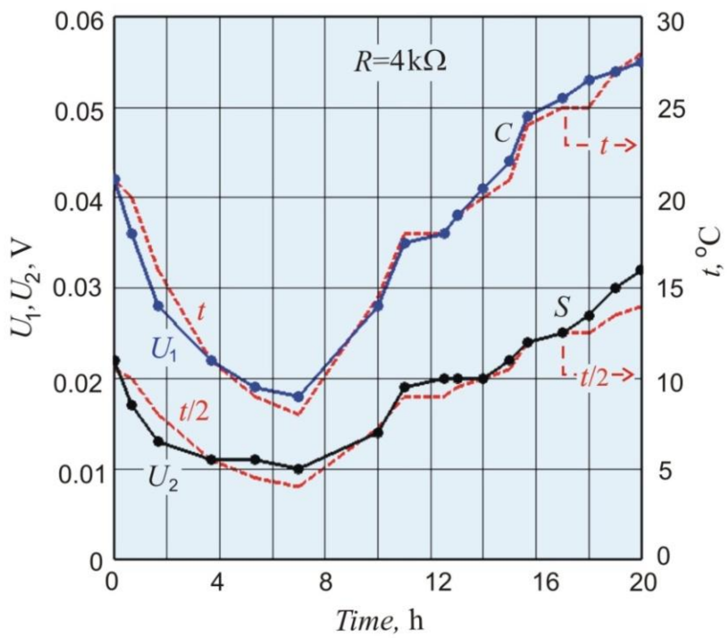

Figure 2. Time Dependencies of Voltages *U* and Temperature *t*

Moreover, a change in ambient temperature is accompanied by a corresponding change in voltage. Since at a value of R=4 kΩ the dependence of the voltage U_1 on temperature is linear, then for every degree of temperature change there is 0.2 mV of voltage change.

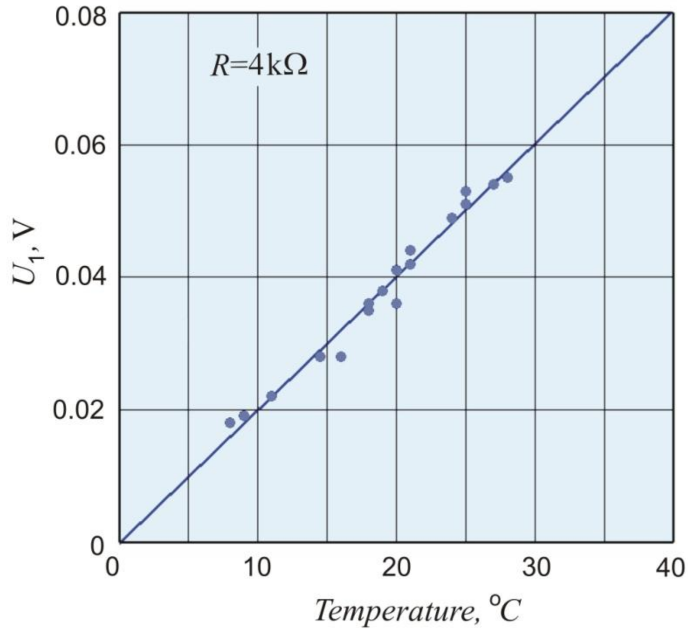

Figure 3. The Temperature Dependence of the Voltage

This applies not only to the source 1, but also to the second source, in which the outer electrode is a spiral. The simultaneous change in voltages is most clearly demonstrated using the correlation shown in Figure 4.

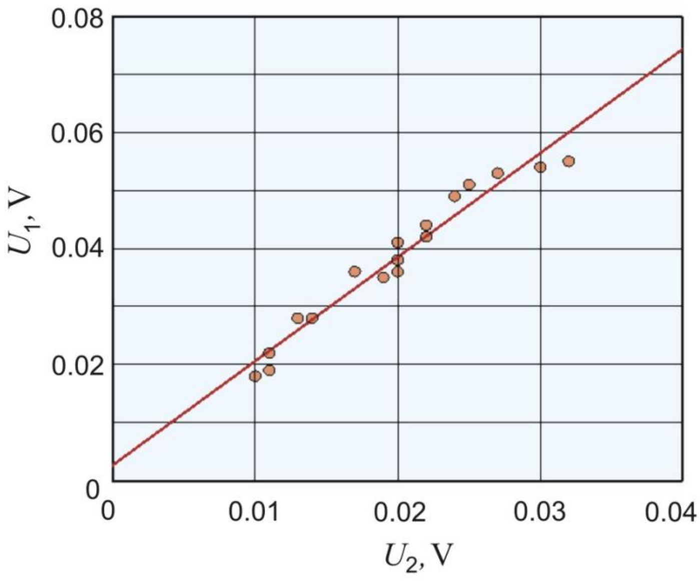

Figure 4. Correlation between Voltages

The influence of one source on another is excluded and is not considered here. Apparently, the ambient temperature simultaneously affects both sources and the temperature sensor. For a conventional chemical source of electrical energy, such an effect is quite understandable [6]. A dark source is fundamentally different from a chemical one. Therefore, it is necessary to study the role of weak chemical processes that occur when aluminum comes into contact with pure water. The closest to the dark source is the simplest chemical source, one of the electrodes is an aluminum plate, and the other is a metal whose properties differ from those of aluminum. Two different sized aluminum electrodes immersed in pure water cannot be useful in such test measurements. The current that they produce is the dark current, the effect of temperature on which remains unclear. Referring to such arguments and Figure 5, we can confidently state that, at least in the temperature range from several degrees to 30 ^{O}C, the chemical reactions of aluminum with distilled water do not affect the formation of the dark current.

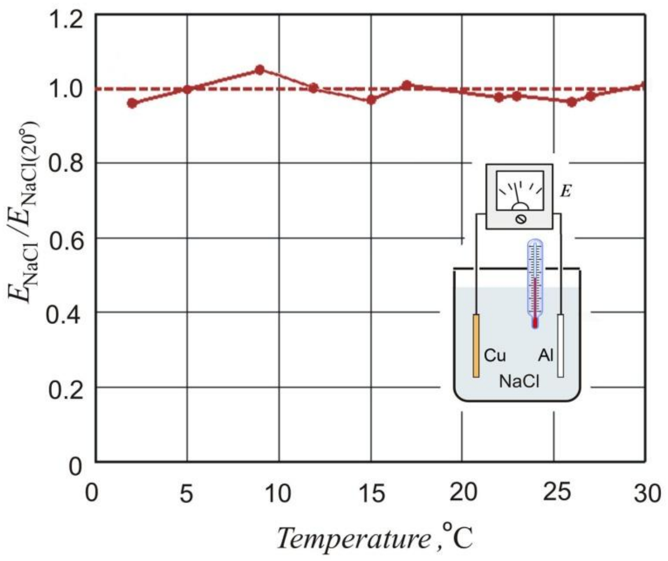

Figure 5. Effect of Temperature on the Electromotive Force of a Chemical Source of Electric Energy

Changing the water temperature in such a primitive source does not lead to significant changes in the electromotive force generated by such a test source. That is why there is a reason to consider the dark source of electrical energy as an unusual source that receives energy either due to quantum processes, or with a seeming violation of the second law of thermodynamics. In another way to explain the unambiguous relationship between voltage changes *U* and ambient temperature *t*, shown in Figure 2, until it remains fails. One should hardly regard the experimental results described above as paradoxical, allowing for a simple solution and interpretation. Not everything is as simple as it might seem, considering such simple designs of electric current sources.

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