

## **Thunderstorms of the caves**

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The conducted experimental investigations showed that mechanical stresses or destruction of conductors and dielectrics lead to the appearance of unitary charge in such models. Friction between the separate threads or the dielectric layers they lead to the same effect. With the earthquakes, which are the consequence of the accumulation of stresses in the layers of species and their subsequent break or relative shift, also must appear the electric potentials, which present the unitary of charge, whose fields can without difficulty penetrate through the rocks, falling into the atmosphere and into the ionosphere. The shift processes, which associate earthquakes, which lead to the friction between the shifting layers, also can lead to the appearance of electrical pour on. These fields can ionize the atmosphere and the ionosphere, causing its glow. If tension pour on, that appear with such processes, exceeds breakdown stress for the atmosphere, then lightning can appear. The seismic waves, which are extended during the earthquakes, also lead to the periodic mechanical deformations of the layers of species. These deformations also can cause the appearance of electrical pour on out of the zone of the propagation of such waves.

In the article the physical substantiation of the obtained experimental results is given. Conducted investigations give the physical and theoretical substantiation of the electrical phenomena, which associate earthquakes.

The Keyword: thunderstorms, caves, electrical phenomena, seismic waves, mechanical stresses.

## 1. Introduction

The earthquakes are accompanied by the appearance of electrical phenomena which they did not up to now find its explanation. In 1847 before the earthquake into Sinsyu (Japan) against the background of dark sky arose the revolving fiery cloud. It moved to the side of mountain it was ide and, its dostignuv, it disappeared. In 1911. On the eve of the earthquake in Germany in the cloudless sky appeared the fireball, and 26 November 1930 before the earthquake in before the earthquake in peninsula Idzu (Japan) of the aurora borealis. Survived Ashkhabad tragedy 1948 they say, that on the eve of the earthquake they saw the arc from the electrical discharges flying on the sky, then, immediately after wind gust, it was heard the first underground push. During the Tashkent earthquake 1966 from under the earth was pulled out the gigantic luminous torch, it swiftly rose upward and it was dissolved in air. In 1976 occurred super-power Tien-Shan earthquake , during which light flashes they were controlled hundreds of kilometers from the epicentre of earthquake.

The earthquake begins from break and displacement of the rocks in the depth of the Earth [1-4]. This place is called seismic center or hypocenter . Its depth usually is not more than 100 km, but sometimes it reaches also 700 km. In some cases the layers of the earth, situated along the sides of breaking, are moved to

each other. In others- the earth on one side of breaking descends, forming discharges. Underwater earthquakes are the reason for the tsunami , of the long waves, generated by powerful action on entire thickness of water in the ocean, during which occurs the sharp shift (raising or lowering) of the section of the sea bottom. Tsunami are formed with the earthquake of any force, but large forces those, which appear as a result of the strong earthquakes, reach. The sharp displacement of the large masses of the earth in the seismic center is accompanied by the mechanical impact of colossal force. The energy, isolated with such impacts, can repeatedly exceed energy of the nuclear explosions [5]. It is natural that such processes are accompanied by colossal mechanical stresses and powerful gaps of the layers of species. From the seismic center the seismic waves, which are also characterized by periodic mechanical compression and tension of layers and rocks, are propagated. Sometimes earthquakes are accompanied by the appearance of lightning.

From the aforesaid follows the consequence about the fact that the electrical phenomena, which accompany earthquakes, can be connected with the mechanical processes in the layers of species.

## **2 Experimental study of the appearance of electric potential during the metallic models and the dielectrics with their deformation and the destruction**

A study of the influence of mechanical stresses and kinetics of dislocations on the electrostatic potential of models was conducted employing the following procedure [6-8]. For this copper flask with the thickness of the walls ~ 3 mm and by volume near ~ 5 liters of it was placed into vacuum chamber, from which could be pumped out air. The

end walls of flask were executed in the form hemispheres. The internal cavity of flask in conducting the experiments was found under the atmospheric pressure. Pumping out or filling into vacuum chamber air, it was possible to mechanically load its walls. Flask itself was isolated from vacuum chamber bushing from teflon resin and thus it had high resistance relative to the housing of unit. One of the typical dependences, obtained with such experiments, is represented in Fig. 1. It is evident that the amplitude of effect reaches 100 mV, dependence has strong hysteresis, moreover an increase in the negative potential corresponds to the tension of the walls of flask. In the figure the circuit on the hysteresis loop was accomplished clockwise. It follows from the obtained results that mechanical stresses of model lead to the appearance on it of electrostatic potential. The presence of hysteresis indicates that the formation of dislocations bears the irreversible nature. In this case the irreversibility of the influence of dislocations on the electrization is connected with the fact that dislocation they can, falling into potential wells, to be attached on the heterogeneities of crystal structure.

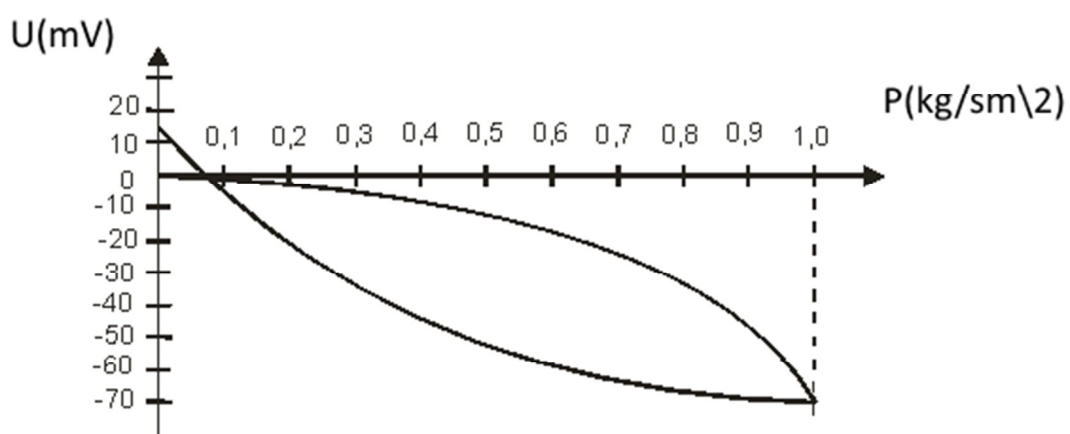


Fig. 1. Dependence of the potential of copper flask on the external pressure.

It follows from the carried out examination that also the appearance of rapid (impact) mechanical loads also must lead to the appearance in the isolated metallic model of pulse potential. This question was investigated on the installation, whose schematic was given in Fig. 2. [9].

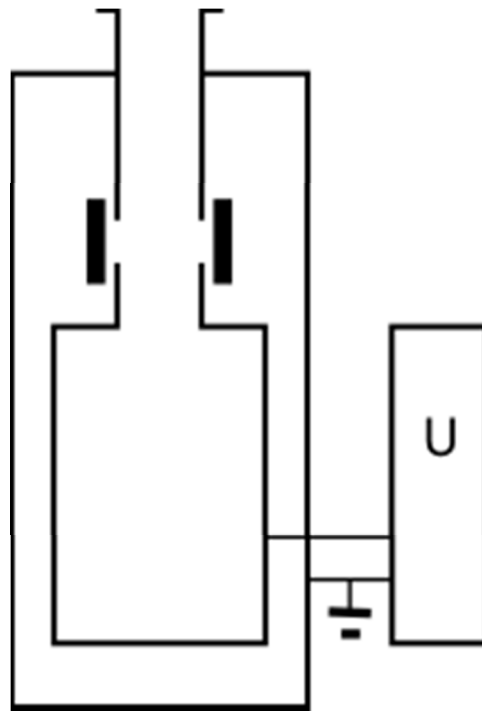


Fig. .2. Installation diagram for investigating the appearance of the pulses of electric field with the impact loads.

Internal capacity is suspended to the external screen with the aid of wide neck. For eliminating the galvanic contact between the external screen and the internal capacity the neck has a section. Odd parts of the neck are connected by the insulating plates, which in the figure are designated by

the short black sections of lines. Internal capacity is prepared from aluminum in the form of flask, its end walls are executed in the form hemispheres. This construction of end walls is necessary in order to avoid their severe strain with the realization of the explosions of explosive in the internal capacity. Common form installations for investigating the dynamic loads on the aluminum flask and the component parts of the installation are shown in Fig. 3 and Fig. 4.



Fig. 3. The common form of installation for investigating the dynamic loads.



Fig. 4. Type of installation in the dismantled form.

During the inclusion into neck from a height 1 m of the bottom of the internal capacity of the rod with a weight 200 g between the external screen and the internal capacity is observed the voltage pulse, shown in Fig. 5. In order to avoid to the appearance of additional pulses with a lateral drop in the rod after the impact of its end about the bottom of flask, the side of rod is wound by soft tissue. Data of this experiment correspond to the experimental data, obtained with the copper flask, the

code its tension led to the appearance on the flask of negative potential. With the impact of the end of the rod about the bottom of flask also occurs the local deformation of its bottom, with which in the point of impact occurs the tension.

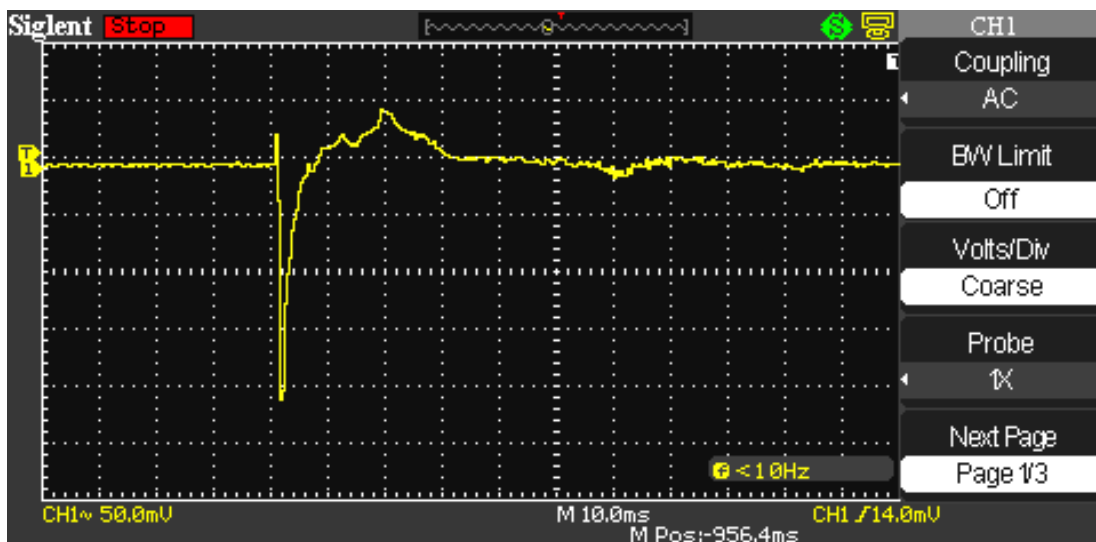


Fig. 5. Shape of pulse after a drop in the rod on the bottom of internal capacity.

If we inside the aluminum flask explode the charge of small value, then is observed the voltage pulse, shown in Fig. 6 .



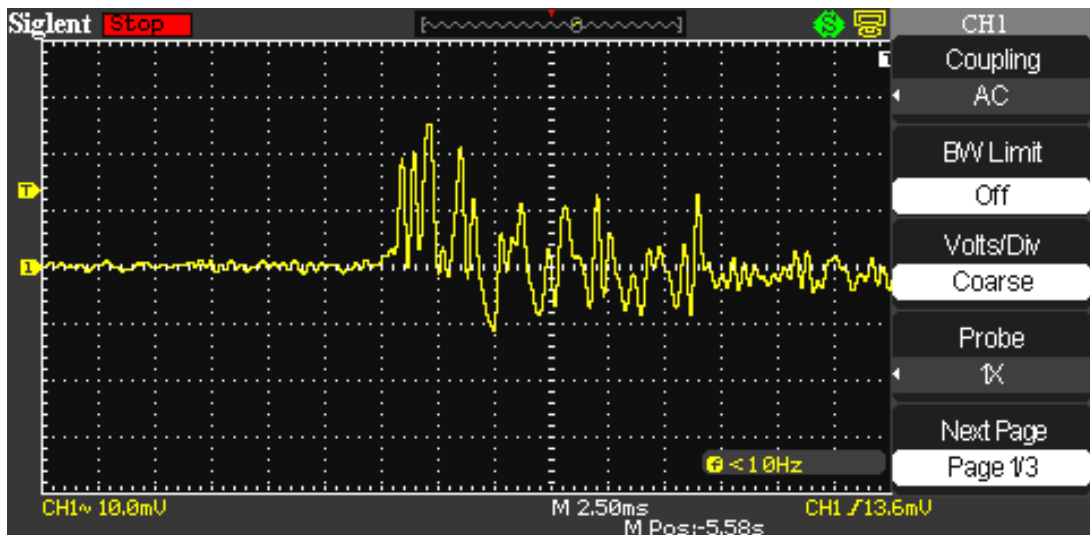


Fig. 6. Form of the voltage pulses, obtained with the explosion of explosive in the aluminum flask.

The heteropolar repetitive pulses, which are been the consequence of the multiple reflection of shock wave from the walls of the flasks, which lead to its deformation, are observed in the oscillogram, in this case there are pulses corresponding to both the tension of the walls of flask and to their compression.

If we into the aluminum flask place the spring, isolated from the flask, and to force it periodically to be compressed, then potential on the flask also bears periodic nature. The experiment indicated was conducted according to the diagram, depicted in Fig. 7.

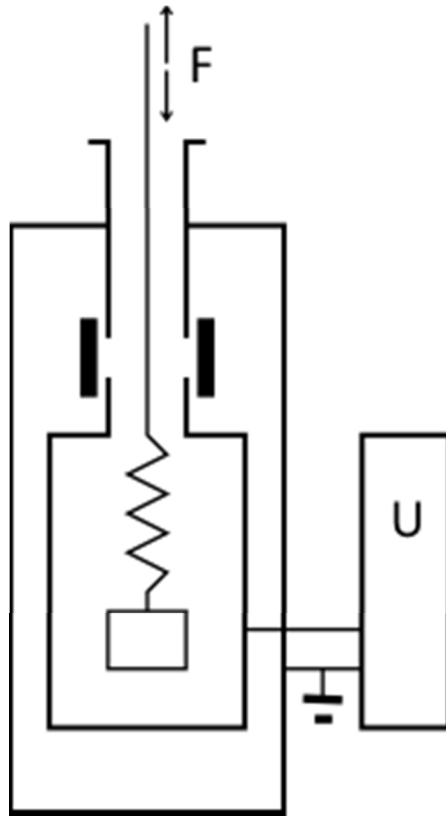


Fig. 7. Diagram of experiment with the spring.

To the cotton cord, which emerges outside flask, is fastened the spring, from which is suspended the load. This system is had the mechanical resonance, whose resonance frequency, determined by spring constant and by cargo weight. If we toward the end thread exert periodic force at the frequency of resonance, then it is possible to attain the periodic deformation of spring at this frequency with in effect constant position of load.

The dependence of electric potential on the flask, obtained in this experiment, it is shown in Fig. 8.

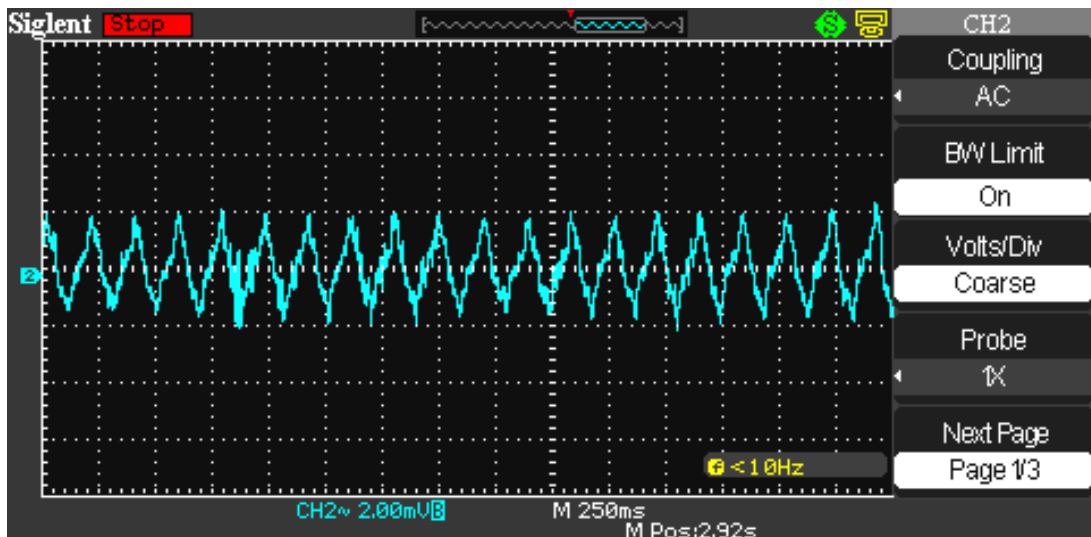


Fig. 8. An alternation in the potential on the flask with the periodic compression of spring.

Obtained data attest to the fact that in the process of the deformation of spring, in the flask the alternating unitary charge is formed.

If we inside the flask tear thin copper wire, then the voltage pulse also is observed between the flask and the external screen. This experiment was conducted according to the diagram, shown in Fig. 9.

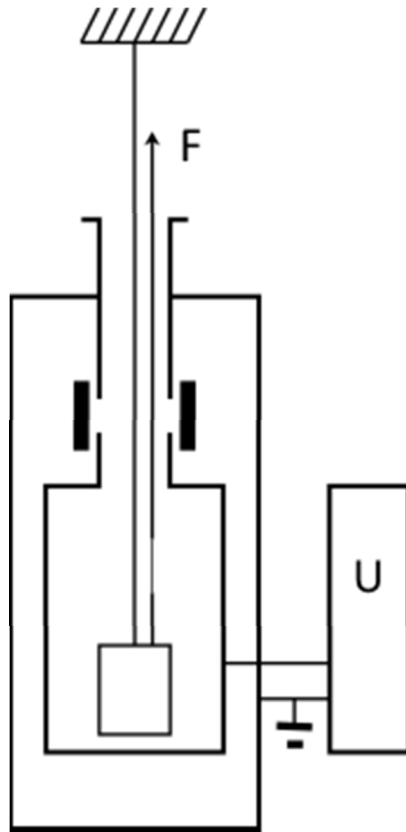


Fig. 9. Experiment on the break inside the flask of copper wire.

The load is suspended inside the flask from the cotton cord. In parallel with the thread, from which is suspended the load, is located another silk thread, in break of which is fixed the section of the copper wire with a diameter 0.3 of mm. At the moment of the break of the wire between the flask and the external screen is observed the pulse, depicted in Fig. 10.

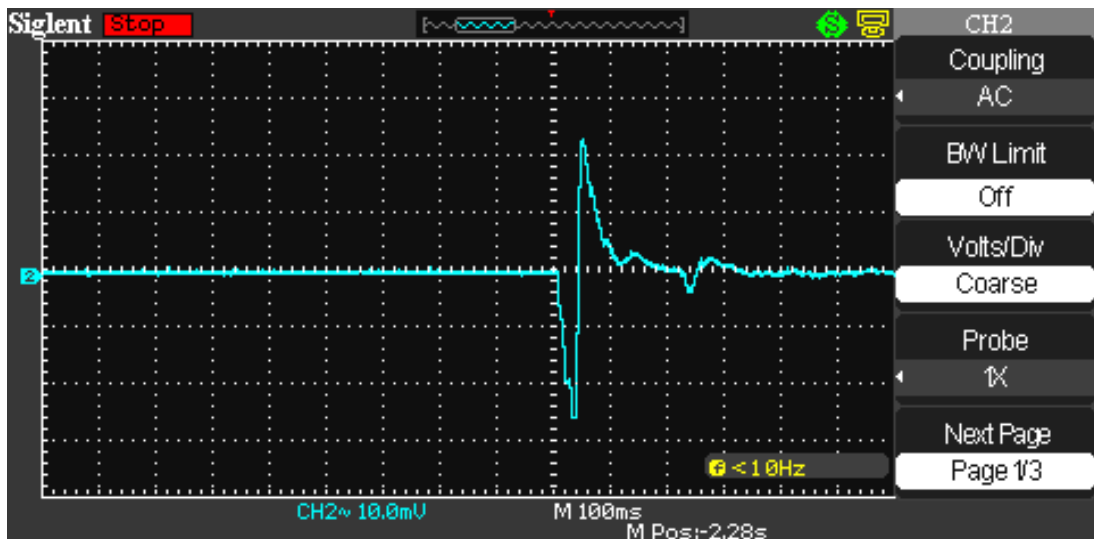


Fig. 10. Pulse, obtained with the break of wire.

The negative part of the pulse corresponds to the tension of wire, which precedes its break. The positive part of the pulse corresponds to relaxation of deformation stress two parts of the torn wire.

In such a manner both the mechanical deformation of wire and its break it is accompanied by the appearance of unitary charge inside the flask.

Electrization appears also with the mechanical dielectric strains. If we conduct experiment with the dielectrics employing the procedure, depicted in Fig. 10, on it is possible to obtain the following results. With the break of silk thread is observed the oscillogram, given in Fig. 11.

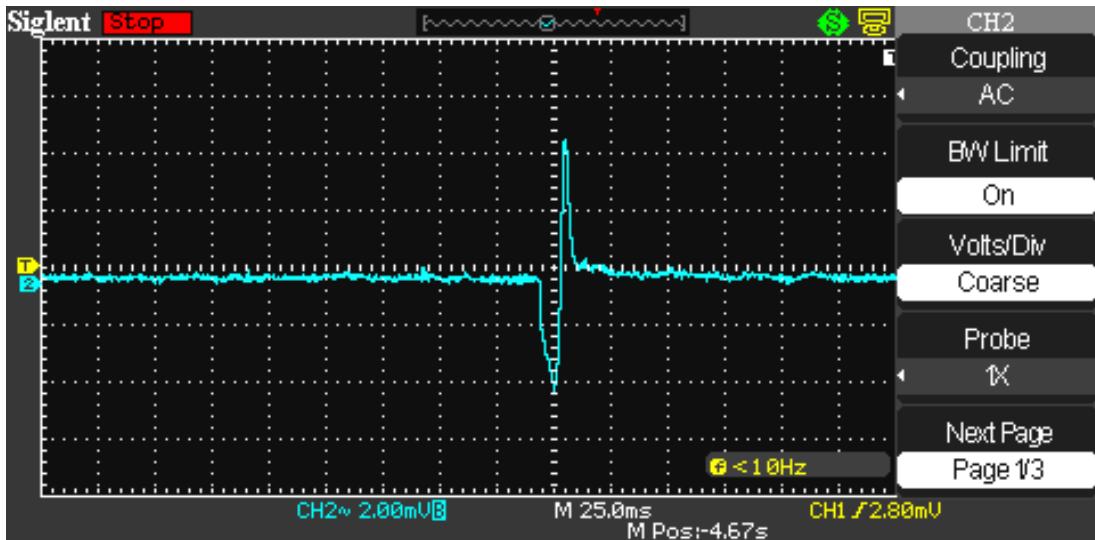


Fig. 11. With the break of silk thread is observed the oscillogram.

In Fig. 12. is depicted the oscillogram, observed with the break of thread from vinyl chloride.

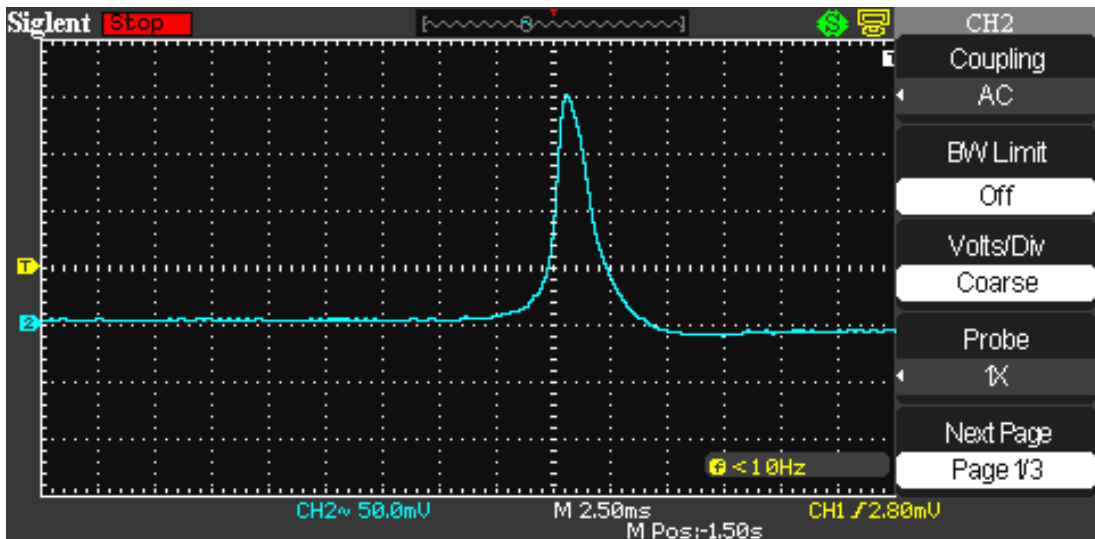


Fig. 12. Is depicted the oscillogram, observed with the break of thread from vinyl chloride.

If we as the thread use the lace, interlaced from the synthetic fibers, and to subject to its periodic mechanical loads, then will be obtained the oscillogram, given in Fig. 13.

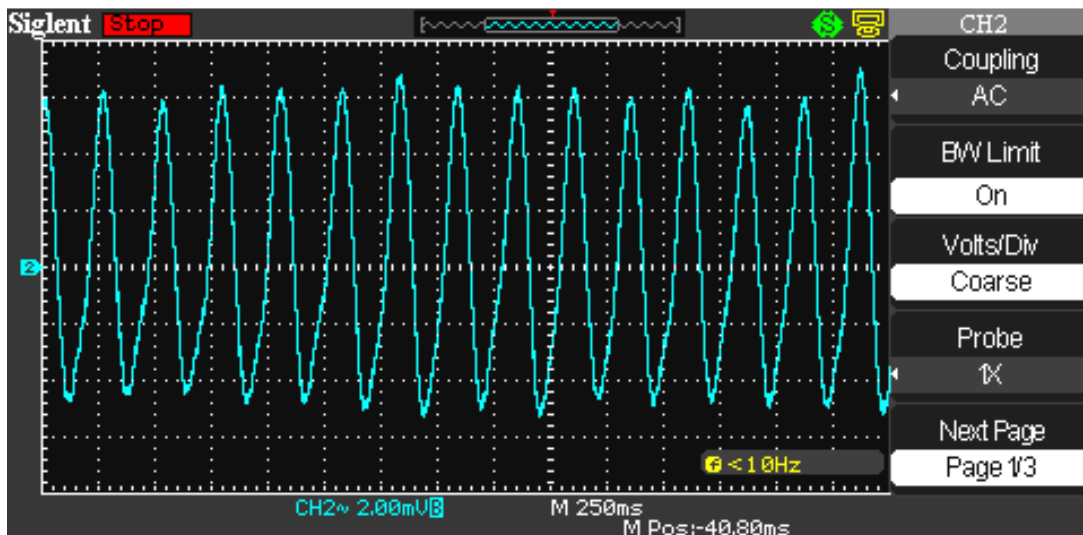


Fig. 13. Oscillogram, observed during application to the lace of periodic mechanical loads.

Such properties of dielectrics earlier in the scientific publications are not described. Obtained experimental data speak, that by the way of compression, tension or destruction of conductors and dielectrics, placed in Faraday cage, it is possible to obtain in it the unitary charge of different signs, whose fields without difficulty penetrate through the metal screen of Faraday cage. Friction between the separate threads of dielectric generates the same effect, about than testify the experiments with the lace, made from such threads.

### 3. Physical interpretation of the experimental results

if in any structure coexists several thermodynamic subsystems, then their chemical potential must be equal. In general form chemical potential for any subsystem can be found from the following expressions

$$\mu = \left( \frac{\partial U}{\partial N} \right)_{S,V} = \left( \frac{\partial F}{\partial N} \right)_{T,V} = \left( \frac{\partial W}{\partial N} \right)_{S,P} = \left( \frac{\partial \Phi}{\partial N} \right)_{T,P}$$

where  $N$  is number of particles, and the thermodynamic potentials of  $U, F, W, \Phi$  represent internal energy, free energy, enthalpy and Gibbs potential respectively.

In the conductor there are two subsystems: lattice and electron gas, electron gas in the conductors at usual temperatures is degenerate and is subordinated the statistician Fermi-Dirac, his chemical potential is determined from the relationship

$$\mu = W_F \left( 1 - \frac{\pi^2 (kT)^2}{12 W_F^2} \right),$$

where

$$W_F = \frac{h^2}{2m} \left( \frac{3n}{8\pi} \right)^{\frac{2}{3}}$$

is Fermi energy,  $h$  is Planck constant, and  $n$  and  $m$  are electron density and their mass.

Consequently, at an assigned temperature chemical potential of electron gas depends on its density.



Chemical potential of lattice depends on mechanical stresses and number of dislocations. And if lattice was subjected to mechanical stresses, then for retaining the electroneutrality of models should be changed the density of electron gas that it can be achieved by the way of addition or withdrawal of electrons from the model. If we this do not make, then model will acquire additional potential, that also is observed in the experiment.

#### **4. Conclusion**

The conducted experimental investigations showed that mechanical stresses or destruction of conductors and dielectrics lead to the appearance of unitary charge in such models. Friction between the separate threads or the dielectric layers they lead to the same effect. With the earthquakes, which are the consequence of the accumulation of stresses in the layers of species and their subsequent break or relative shift, also must appear the electric potentials, which present the unitary of charge, whose fields can without difficulty penetrate through the rocks, falling into the atmosphere and into the ionosphere. The shift processes, which associate earthquakes, which lead to the friction between the shifting layers, also can lead to the appearance of electrical pour on. These fields can ionize the atmosphere and the ionosphere, causing its glow. If tension pour on, that appear with such processes, exceeds breakdown stress for the atmosphere, then lightning can appear. The seismic waves, which are extended during the earthquakes, also lead to the periodic mechanical deformations of the layers of species. These deformations also can cause the appearance of electrical pour on out of the zone of the propagation of such waves.

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