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Transfer of "dark hydrogen" by atomic matter. Methods of diagnostics of "dark hydrogen"

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Abstract: **This work experimentally shown that traces found on track detectors during the study of low-energy nuclear reactions are also formed in the course of many widely used technical processes (combustion of hydrocarbons, operation of internal combustion engines, physicochemical processes accompanying the process of charging smartphone batteries). This coincidence of the track pattern allows us to consider low-energy nuclear reactions as a significant environmental factor, and indicates the important role of "dark hydrogen" in nature. The paper shows the convective transfer of "dark hydrogen" from the discharge zone along the path of the air-water mixture. Using the theoretical model of "dark hydrogen", fundamentally new, less laborious, in comparison with track, methods of its registration have been developed and described: 1) measurement of the charge of a copper box with its irradiation with "dark hydrogen", 2) measurement of pressure in a closed volume when irradiated with "dark hydrogen", 3) the use of a torsion balance with a nickel plate with magnets when irradiated with "dark hydrogen".**

Keywords: **low-energy nuclear reactions, "dark hydrogen", track detectors, tracks, registration methods.**

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Contents

1. INTRODUCTION

The work of the authors of the 2018 [1] led to the understanding that the reactions that are responsible for the "excess" energy release in LENR reactors go with the formation of a special form of substance, which was called "dark hydrogen". Experiments on the detection of soft and hard *X*-rays with energies of 28 keV and 260±30 keV at a 20 kV discharge in a water-air droplet medium are described in [2-3], and a model of a "dark hydrogen" particle is constructed. In [2], the sign $\hat{H}_2$ was introduced to denote "dark hydrogen".

In [3], a model of $\hat{H}_2$ is constructed that allows analyzing the unique physical and chemical properties of $\hat{H}_2$, which requires the development of special methods for its registration and research. One of the properties of "dark hydrogen", which is noted in [3], is the ability to form a compound with the atoms (nuclei) of particles of the surrounding matter. In this reaction of $\hat{H}_2$ with the surrounding matter, an energy of several hundred keV is released per single act. It is this property of "dark hydrogen" that helps the formation of tracks and craters in the substance located near its source. "Dark hydrogen" of 10-13 m in size can be the basis for constructing objects of 10-10 m or more in size. In this range of sizes lies a gigantic variety of "unknown particles" of new matter.

In many studies, the formation of craters and tracks in the surrounding matter was recorded during experiments with electric discharges [3], and with a nickel-hydrogen reactor [4].

In this paper, it is experimentally shown that tracks and craters (derivatives of "dark hydrogen") are formed in many other processes: near a gas burner, in the exhaust of a car, when charging a smartphone. These experiments, made using CD disks as detectors, suggest a more significant role for "dark hydrogen" in nature.

With the help of CD disks, the convective transfer of "dark hydrogen" from the discharge zone along the path of the water-air medium movement was registered, when CD disks were located along the path of movement.

In this paper, the registration of "dark hydrogen" was carried out by three other fundamentally new, less time-consuming methods than the analysis of tracks on CD: (1) measurement of the charge of a copper box with an electroscope when it is irradiated with "dark hydrogen", (2) measurement of the pressure in a closed volume when irradiated with "dark hydrogen", (3) use of a torsion balance with a Ni plate with magnets when irradiated with "dark hydrogen".

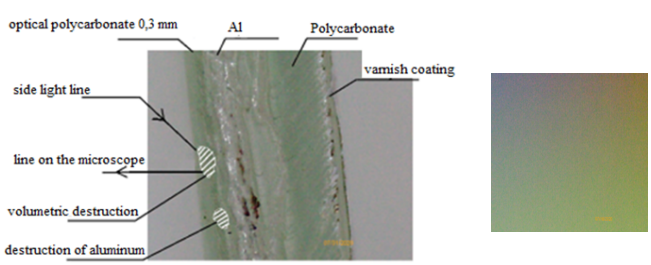
Experimental methods for detecting "dark hydrogen" (1)-(3) were developed on the basis of a theoretical model. The successful implementation of these methods confirms the validity of the theoretical model.

2. REGISTRATION OF UNKNOWN PARTICLES USING CD

Perhaps one of the first researchers who described the use of a CD disk for recording unknown radiation from a reactor was paper [5]. Before him, *X*-ray films were used to record traces of unknown radiation [4]. Other works describe traces of unknown radiation recorded on glass, smooth metal surfaces [6], and on ccarbon paper.

Almost all the photos presented in this paper are reduced to a uniform scale, at which the width of the photo corresponds to 2 mm of the field of observation in the microscope. The multi-colored triangle at the top of the photos is due to the side illumination, which is done to visualize the traces of unknown particles.

The CD surface, which, when registering traces of unknown radiation, turns to the source of unknown radiation, has the appearance of a smooth surface with an aluminum sheen. But this is not an aluminum surface, as can be seen from the left part of **Fig. 1***a*, but a surface of optically transparent polycarbonate with a thickness of 0.3 mm. The aluminum layer is located deeper. Thus, the unknown particles that are detected by CD leave their traces in the surface layer and in the depth of the polycarbonate deposited on the aluminum layer. It is also possible for unknown parts to adhere to the CD surface. The right side (*b*) of Fig. 1 shows the recording surface of the CD before placing it in the vicinity of the reactor. It can be seen that the recording surface is smooth and has no noticeable craters, tracks, or stuck particles.



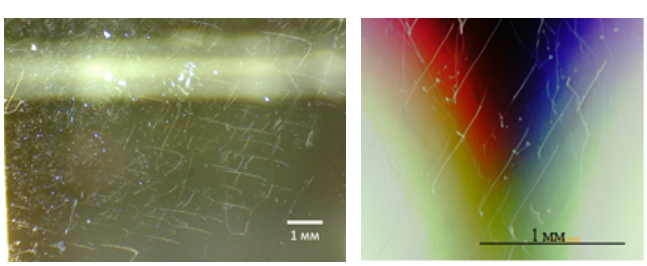
a *b*

Fig. 1. *(a) - a photo of the CD cut under a microscope, (b) a recording surface of a fresh CD under a microscope with an x40 magnification.*

3. THE UNIFIED NATURE OF UNKNOWN PARTICLES ARISING FROM THE OPERATION OF VARIOUS REACTORS

We believe that the nature of the "unknown particles" that are detected near: *a*) nickel-hydrogen heat generators, *b*) during the electric explosion of a metal foil, *c*) during a discharge in a heterogeneous water-air environment, are of a similar nature and are traces formed by the reaction of "dark hydrogen" or "dark hydrogen" compounds with the usual substance of the CD surface material. The basis for this statement is the registration of *X*-ray radiation of 28 keV and 260 keV, characteristic of "dark hydrogen", during the discharge in the water-air medium, and the coincidence of the nature of the traces on the CD in the vicinity of the nickel-hydrogen reactor and near the discharge in the water-air medium.

The two photographs in **Fig. 2** compare the traces in such experiments. Photo in Fig. 2*a* the surface of the CD located next to the nickel-hydrogen reactor from the article [5]. Photo Fig. 2*b* the surface of a CD located near a high-voltage electric discharge in a water-air environment (this work). It can be seen that the characteristic features of the traces in the two experiments coincide. There are usually different types of tracks on a CD. We specifically chose a zone with tracks similar to



a *b*

Fig. 2. *Traces of unknown particles on the surface of the CD: (a) - nickel-hydrogen reactor* [5], *(b) - this work, discharge in a heterogeneous water-air environment.*

the tracks registered in [5]. These are relatively short club-shaped tracks. It can be seen that not only the shape of the tracks, but also their length in photo (*a*) and (*b*), taking into account the scale, are close to each other. It can also be seen that both in photo (*a*) and photo (*b*) there are point traces scattered around the observation area.

The coincidence of the shape of the traces suggests a similar mechanism of their formation, despite the completely different types of reactors that generated unknown particles.

4. UNKNOWN PARTICLES ARE THE PRODUCT OF THE INTERACTION OF "DARK HYDROGEN" $\hat{H}_2$ WITH ATOMIC MATTER

The question arises as to how the tracks appear on the CD. Some researchers believe that the traces are the conversion of the kinetic energy of an" unknown " particle into heat, which leads to the evaporation of the polycarbonate covering the disk. But if we take into account the fact that there are three types of traces-tracks, craters and "adhered" particles, and the craters have a complex shape and are completely different from the craters from the impact, then it seems more natural to assume that the traces are the result of the transformation of the energy of the electromagnetic interaction of an unknown particle and the polycarbonate molecules of the disk. Moreover, this interaction involves not only electrostatic potential forces, but also the forces of magnetic interaction.

To answer this question, we consider it appropriate to use the ideas about" dark hydrogen " developed in [1-3]. There are a lot of questions about the interaction of "dark hydrogen" $\hat{H}_2$ with atomic matter. We are just beginning to explore this topic. In fact, we are talking about creating an independent science, which can be called "High-energy Chemistry". But we can already say something about the reaction (1)

$$\hat{H}_2 + A \rightarrow (\hat{H}_2{*}A) + q, \quad (1)$$

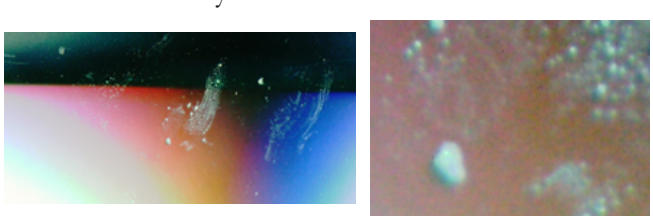
where one of the atoms that make up substance A (most likely oxygen) interacts with a particle of "dark hydrogen" $\hat{H}_2$, $(\hat{H}_2{*}A)$ is the quasimolecule formed, q is the heat released. The value of q can reach several MeV, which will lead to melting and evaporation of the substance in the vicinity of the quasimolecule $(\hat{H}_2{*}A)$. This quasimolecule has a magnetic moment and causes polyatomic structures to form from neighboring carbonate atoms. This polyatomic structure is perceived as a "adhered" particle located in the crater.

5. REGISTRATION OF "ADHERED" UNKNOWN PARTICLES. MAGNETIC PROPERTIES OF UNKNOWN PARTICLES

As an example of particles stuck to the surface, you can give the photo in **Fig. 3**. Photos (*a*) and (*b*) show a trace of a beautiful shape in the form of a "pearl pendant". In photo (*a*), the scale is such that the width shows 2 mm of the observation area. The size of the large footprint in the center of photo (*a*) is approximately 17 microns. In the enlarged photo (*b*) Fig. 3 you can see that a bluish particle is embedded in the large trace. It is possible that this is an adherent particle formed as a result of the adhesion of the polycarbonate substance due to the magnetic properties of the atom $(\hat{H}_2{*}A)$.

Reconstruction of the crater on the Amphora microscope in [7] **Fig. 4***b*, confirms that "adhered" spherical particles are formed in the crater.

Very often, craters form circular structures that are clearly similar to the behavior of



a *b*

Fig. 3. *Example of particles adhering to the CD surface.*

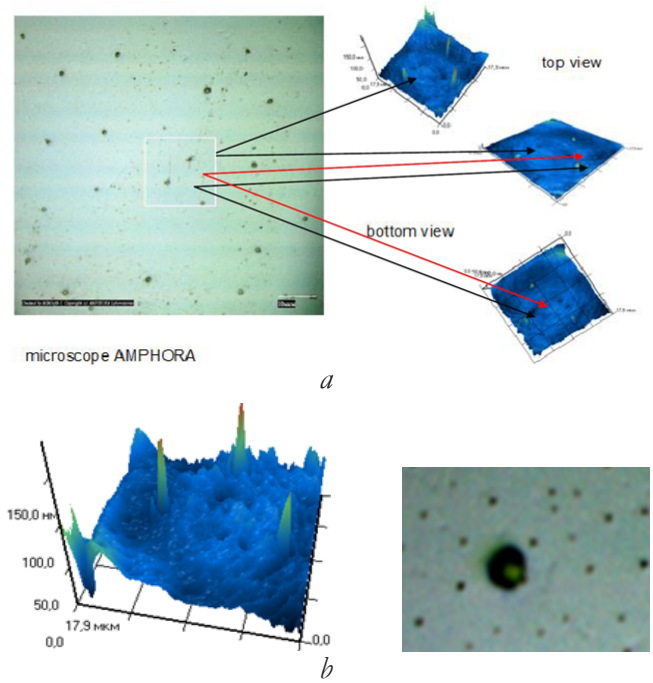


Fig. 4. *An example of "unknown particles" (balls) and pits (shown by red arrows) on a golden surface (a) from* [7]*, their three-dimensional reconstruction only for the area in the white square (b), an example of a large ball against a background of small ones (c). These measurements were carried out on an AMPHORA microscope.*

particles with magnetic properties. The presence of magnetic properties in the traces of particles of unknown radiation is easily explained if we assume that the particle is constructed with the participation of "dark hydrogen", which has a noticeable magnetic moment. In the left part of **Fig. 5**, two circular tracks are clearly visible, which are made up of spherical tracks.

Fig. 5 shows a more complex trace on the CD, around which small craters are visible, forming a circular structure, which also confirms the considerations about the magnetic property of the particles forming the craters.

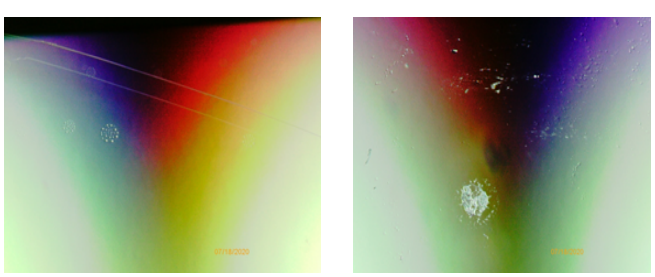


Fig. 5. *The magnetic properties of unknown particles are manifested in the formation of circular traces.*

6. TRANSFER OF "DARK HYDROGEN" BY ATOMIC MATTER

One of the sections of research on the interaction of "dark hydrogen" and atomic matter is the question of whether or not "dark hydrogen" $\hat{H}_2$ is transferred by atomic matter. In experiments on the transfer of "dark hydrogen", we used the previously approved [2-3] method of generating" dark hydrogen " in a high-voltage electric discharge in a finely dispersed water-air mixture.

Fig. 6 shows a humidifier that creates a flow of fine-dispersed water-air medium using high-frequency vibrations of a ceramic piezoelectric. From the humidifier, the flow is directed through a dielectric hose with a diameter of 12 mm and a length of 1.5 m at a speed of approximately 1m/s to the Discharge chamber I. In the I-size discharge chamber 12×12×13 cm, made of 10 mm Plexiglass, two electrodes are inserted. The pointed electrodes are made of copper, tungsten and nickel-plated steel. The distance between the electrodes is 2-3 cm. A high voltage with an amplitude of 15-20 kV is applied to the electrodes from the source. The electrodes are arranged in such a way that the electric current generated in the flow of the air-water medium of the electric discharge flows along the flow. The pressure in the discharge chamber is slightly higher than atmospheric pressure, so the water-air mixture that has passed through the discharge flows through a dielectric tube from the Discharge Chamber I to the tightly closed plastic Chamber II and Chamber III located downstream. The distance between the Discharge chamber I, Chamber II and Chamber III is about 7 cm. The

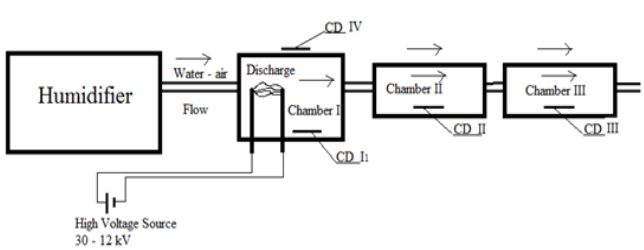


Fig. 6. *The layout of the stand for the study of the transport of "dark hydrogen".*

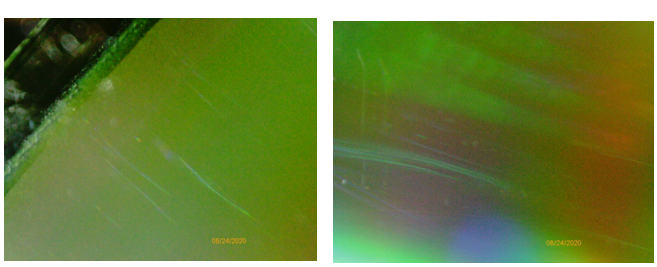
length of Camera II and Camera III is 14 cm. After Chamber III, the water-air mixture enters the exhaust system.

All chambers contain CD disks: in the Discharge chamber I – CDI, in the Chamber II-CDII, in the Chamber III-CDIII. In addition, a CDIV disk is located above the Bit Chamber I. CD disks are used by many researchers to record traces of unknown particles emitted from cold fusion reactors. In this work, the CD was always placed either in a plastic or paper envelope to get rid of dust sticking to the surface of the CD.

Comparison of traces on CD **Fig. 7** (in the Discharge chamber I) and **Fig. 8** (Chamber III) shows that they are very similar. This confirms the thesis that "dark hydrogen", as a source of traces of unknown radiation, is transported along the path together with the movement of the water-air medium. Interestingly, there are fewer traces registered on the disk located in Chamber II than in Chamber III, located further along the path from the Discharge Chamber I.

a *b*

Fig. 7. *Traces on two sections of CD (a) and (b) from "unknown" radiation in the Discharge chamber I.*



a *b*

Fig. 8. *Traces on two CD sections (a) and (b) from "unknown" radiation in Chamber III.*

7. PROCESSES IN WHICH "DARK HYDROGEN" IS GENERATED

In this work, and the works of other authors, it is shown that the source of unknown particles (according to our ideas, this is "dark hydrogen") can be metals saturated with hydrogen and an electric discharge in a medium containing hydrogen. Thanks to our experiments, the range of sources of "dark hydrogen" can be significantly expanded.

7.1. Generation of "dark hydrogen" by burning propane in a gas burner

Fig. 9 shows a layout of the experiment with a gas burner and a CD disc located behind a non-flammable screen. After 3 hours of exposure, a lot of traces appeared on a clean disk in a plastic package (**Fig. 10**).

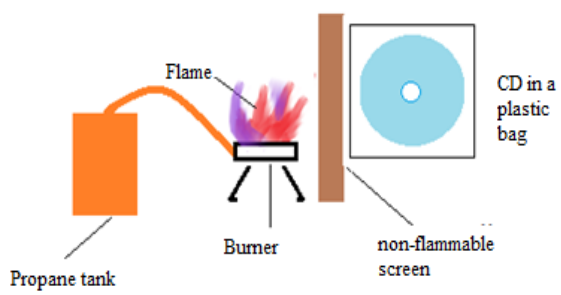


Fig. 9. *The scheme of the experiment with a gas burner.*

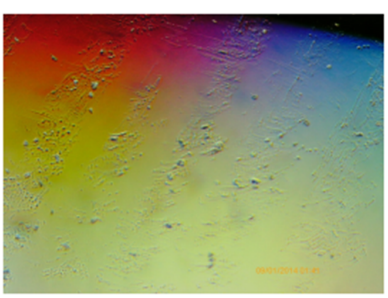


Fig. 10. *Traces on the CD after 3 hours of exposure near the gas burner.*

7.2. "Dark hydrogen" in the exhaust gases of the car

Fig. 11 shows a layout of the experiment with the exhaust pipe of a car engine working and a CD. After 20 minutes of exposure, a lot of traces appeared in the exhaust gas stream of the working car on a clean disk placed in a plastic bag, **Fig. 12**.

Fig. 11. *The layout of the experiment with the exhaust gases of a gasoline-powered engine.*

Fig. 12. *Traces on the disc after a 20-minute exposure near the exhaust pipe.*

7.3. Generation of "dark hydrogen" when charging the smartphone

Fig. 13 shows a layout of the experience of registering traces on a CD located next to smartphones during charging. After 2 hours of exposure, many traces appeared on a clean disk located in a plastic bag, **Fig. 14**.

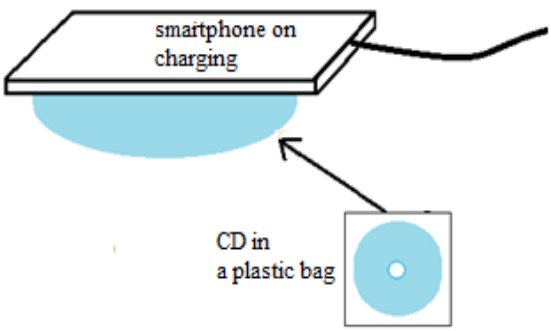


Fig. 13. *Layout of the experience with a smartphone while charging.*

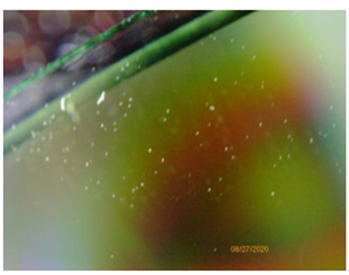


Fig. 14. *Traces on the disk after a 2-hour exposure near the smartphone.*

8. NEW METHODS FOR DETECTING "DARK HYDROGEN"

8.1. Electroscope

The question of the exit of penetrating charged particles from the discharge zone arose in connection with two circumstances. The first is the observation of traces of an unknown nature outside the discharge zone behind dielectric barriers. And the second is that a particle ("dark hydrogen" [1-3]) with two relativistic electrons, despite its quasi-neutrality, creates an electric field in the surrounding space, which is perceived by the surrounding charges as the presence of a charge in $\hat{H}_2$. This charge, or more precisely the sum of these charges, we measured using an electroscope.

It was assumed, given some experience of numerous failures of electronics, that the "dark hydrogen" particles relatively easily seep through the dielectric medium and get stuck in metals. In this case, the metal object is charged. A copper foil box was used as a charge storage device. It was separated from the discharge zone by a dielectric stand made of thick cardboard. The box was connected by a copper wire 1700 mm long with an electroscope (**Fig. 15**). The electrical capacitance of the box-wire-electroscope system was measured. It turned out to be equal to $\sim 3 \cdot 10^{-9}$ F. Test tests of the electroscope showed that the supply of a voltage of 1.8 kV to the copper box leads to a displacement of its dielectric lobes by 1.5 mm. This displacement of the lobes is

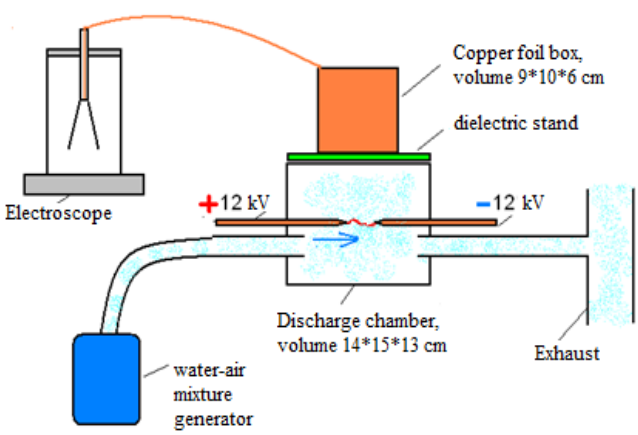


Fig. 15. *Layout of an experiment on charging a copper foil box with "dark hydrogen".*

caused by the charge $q = C \cdot U = 3 \cdot 10^{-9} \cdot 1.8 \cdot 10^{3} = 5.4 \cdot 10^{-6}$ C. A similar divergence of the lobes in the experiment occurs in 10 seconds of operation of the discharge chamber with the supply of a water-air mixture. This means that in 10 seconds, N particles of "dark hydrogen" $\hat{H}_2$ were stuck in the box, each with an electric field equivalent to ~10 units of electron charge:

$N = 5.4 \cdot 10^{-6}$ Кл/(100·1.6·10^{-19}Кл) = $3 \cdot 10^{10}$ particles per 10 sec.

The difference in the effect of the control voltage of 1.8 kV and the charge from "dark hydrogen" on the electroscope was manifested in the discharge rate of the electroscope. The discharge rate for "dark hydrogen" is an order of magnitude slower, which is quite understandable, given the large mass of the particles of" dark hydrogen", with the substance associated with it. This observation is still a very convincing confirmation of the validity of our theoretical model. It should be noted that when the discharge is operated without the supply of a water-air mixture, the charge accumulation on the electroscope does not occur.

8.2. Measurement of pressure in a closed volume (plastic bottle)

The charge-neutral "dark hydrogen" creates a strong electric field around itself and is able to collect dipole molecules from the air, primarily oxygen molecules. A decrease in the number of particles in a closed volume at a fixed temperature leads to a drop in pressure. Thus, the penetration of" dark hydrogen "through the walls into a closed vessel and the subsequent reaction of "dark hydrogen" with air molecules should lead to a drop in pressure.

Fig. 16 shows a layout of an experiment with measuring the pressure in a closed volume in the vicinity of a source of "dark hydrogen".

The pressure in the area near the discharge is stable when the steam-air mixture supply is switched off, **Fig. 17**. When the air-water mixture is supplied, the pressure in the vessel

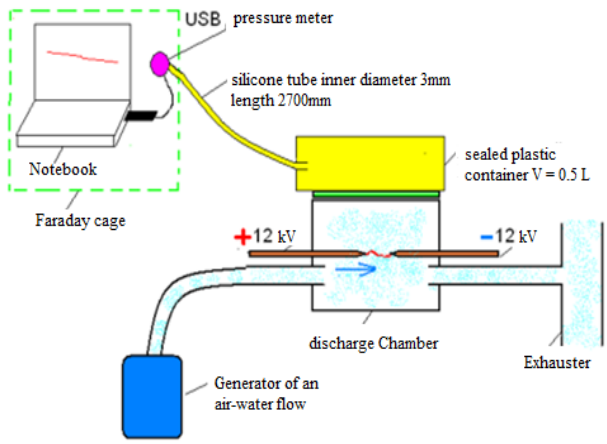


Fig. 16. *Layout of an experiment to measure the air pressure drop in a vessel irradiated with "dark hydrogen". From the discharge to the plastic container 5 cm.*

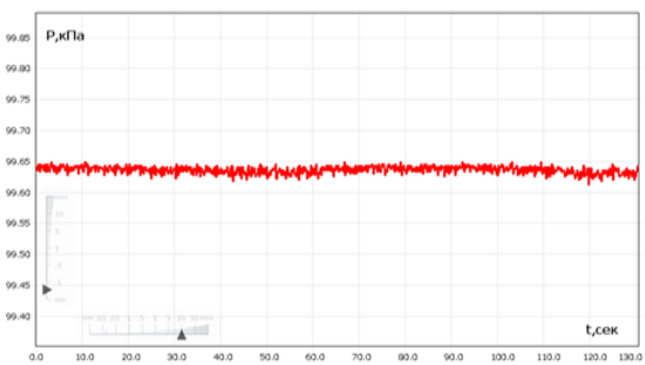


Fig. 17. *Pressure in the vessel during discharge without a water-air medium.*

begins to drop. The pressure dropped by 0.02 kPa (0.02%) in 10 seconds (**Fig. 18**). In total, there are $13.4 \cdot 10^{21}$ air molecules in the vessel, and in 10 seconds "dark hydrogen" bound 0.02% ($27 \cdot 10^{17}$) air molecules. If we assume that 10^{10} particles of "dark hydrogen" got into the vessel (the vessel is similar in size to the foil box from the

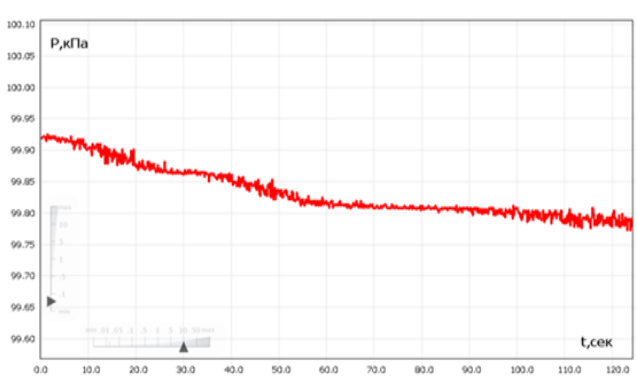


Fig. 18. *Pressure in a closed vessel located near the discharge zone when a water-air medium is supplied to the discharge zone.*

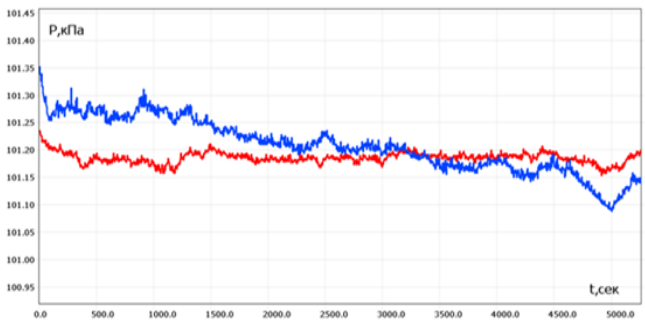


Fig. 19. *Pressure drop in closed vessels (volume = 0.5 liters) irradiated with "dark hydrogen": blue curve-5 cm from the discharge, red curve-30 cm from the discharge zone.*

previous experiment), then we can conclude that one particle of "dark hydrogen" bound about 10^8 air molecules.

The pressure drop in two vessels located at different distances from the discharge was measured, **Fig. 19**. It can be seen that at large distances (30 cm), the pressure drop in the vessel is practically not observed. This is consistent with the data of [5], where it was found that "unknown particles" are 1-2 orders of magnitude less detected by CD disks at distances greater than 20 cm from the reactor.

8.3. Torsion balance with nickel plate and magnets

A torsion scale with a nickel plate and magnets, **Fig. 20**, begins to rotate counterclockwise near a cold fusion reactor containing hydrogenated nickel (see Fig. 1). This is explained by the flow of "dark hydrogen" that escapes from the reactor, gains mass in the paraffin block (6 cm thick) and spins the torsion balance.

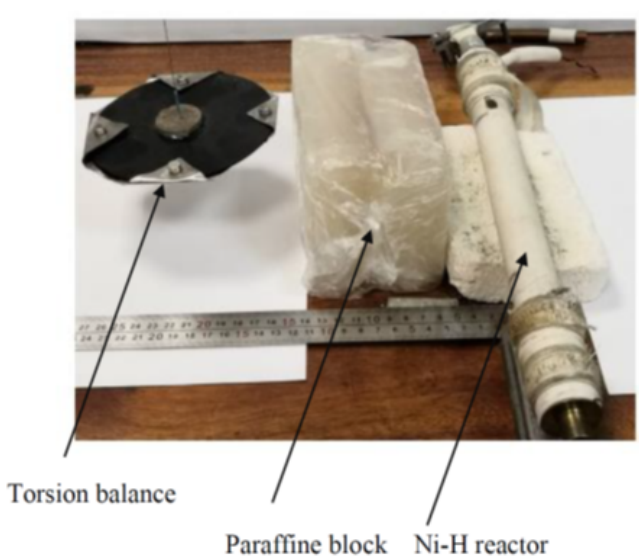


Fig. 20. *Experience on the impact of the Ni-H reactor on the torsion balance.*

9. CONCLUSION

1. It is shown that the substance that forms tracks and craters on CD disks is transported along the path with a water-air mixture.
2. It is shown that the substance that forms tracks and craters on CD disks is formed while a) burning hydrocarbon, b) into an internal combustion engine, c) charging a smartphone.
3. New objective methods for the diagnosis of "dark hydrogen" have been developed, taking into account its physical properties. The application of these methods shows that at least 10^{11} particles per second formed by "dark hydrogen" fly out of the discharge zone in the presence of a water-air mixture. Each particle can bind up to 10^8 oxygen molecules.

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