SYSTEMIC INFLUENCE EFFECTS OF ENERGY INFORMATION FIELD ON OPERATING CHARACTERISTICS OF STORAGE BATTERIES

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Abstract. The rational use of fuel and energy resources is one of the most important economic, social and technical problems in the modern world. The development of the vehicle fleet requires constant optimization of the energy carriers used in road transport. The directions of scientific research, first of all, consider the functioning of the energy-information field created by the generator of heavy particles.As the object of the study, a 18650 SAMSUNG battery was used, intended for electric equipment of vehicles requiring stable current indicators and voltage. In the submitted article directions of improving the performance of Li-ion storage batteries under the influence of the energy-information field created by Kozyrev's heavy particle generator are considered. Experimental studies were carried out on a test complex developed at the St. Petersburg State University of Architecture and Construction, at the Department of Electrical Power Engineering and Electrical Engineering. In accordance with the developed methodology, various technical systems were tested. Positive results were obtained, which indicate an increase in the technical and technological properties of the objects under study. The obtained results indicate an increase in the capacity and output voltage of the Lithium-ion battery18650. Conceptual approaches that allow revealing the essential picture of the phenomena underlying the change in the operational properties of the tested technical systems are formulated. So, a change was found in the parameters of the Lithium-ion battery 18650, affecting the discharge characteristic; it was revealed that under the influence of the SCC there is a decrease in resistance, which positively affects the increase in capacity and output voltage of the Lithium-ion 18650 battery. Directions for further research on the impact of the energy-information field on various objects have been determined.

Keywords: energy-informational field, heavy particle generator, battery capacity.

Introduction

Rational use of fuel and energy resources has become one of the most important economic, social and technical problems in the modern world. Lithium-ion technologies are widely used in aviation, automotive and shipbuilding industries. Boeing is introducing new battery compartment designs that protect the aircraft in the event of a malfunction in the on-board power system. TeslaMotors engineers developed a project for the production of full-cycle lithium-ion electrochemical sources. Studies aimed at increasing the power and capacity of rechargeable batteries and minimizing their weight and size characteristics are being conducted in Japan, Germany and other countries [1-3].

The development of a fleet of vehicles requires constant optimization of energy carriers used on road transport. The use of high-capacity Li-ion batteries will reduce carbon dioxide emissions by 25 % when operating vehicles.

The purpose of the experimental studies is to determine the effect of the energy-information field generated by the heavy particle generator on the main parameters of Li-ion storage batteries.

Materials and methods

The research was carried out on the experimental setup developed at the Saint-Petersburg State University of Architecture and Civil Engineering. The test complex includes:

- device for controlling and recording parameters of Li-ion batteries;
- industrial (unprotected) Li-Ion battery of the size 18650 SAMSUNG ICR18650-22FM 2200 mAh 3.7 V(Korea);
- Kozyrev's heavy particle generator (KHPG), model 003;
- additional measuring and recording equipment.

During the experimental studies Lithium-ion battery 18650 SAMSUNG was used, intended for electrical equipment of vehicles requiring stable current indicators and voltage. The lithium-ion battery18650 provides high discharge currents for small dimensions. Without loss of power, the

battery ICR18650-22FM can withstand up to 500 charge/discharge cycles, after which its capacity can drop to 80 % of the nominal capacity. The impact on the Lithium-ion battery 18650 was carried out using the Kozyrev's heavy particle generator (KHPG). KHPG is a device that creates a vortex flow of particles (Fig.1). Objects that fall into this field change their properties. For example, multiple studies of various types of autotractor fuels have shown that after processing with the help of KHPG, their electromagnetic properties are changed: the hourly fuel consumption decreases by 2-7 %, and environmental indicators improve by 4- 6 %. These changes are significant and cannot be attributed to statistical errors [4-7]. When the generator is exposed to the objects used, a stable angular moment arises, i.e. moment of momentum, which is in fact a charge. The charge creates a "spinor" field around itself, resulting in a change of the geometry "space-time" [8-11]. The flow of energy actively interacts with the object, transferring to it the "prints" of the properties and structures of the bodies with which it "collides". Time destroys the bodies, violates their internal organization. As a result, harmonization (increase of efficiency) of electrochemical processes in the accumulator occurs, its basic indicators are improved, and internal resistance is reduced.

a) b)

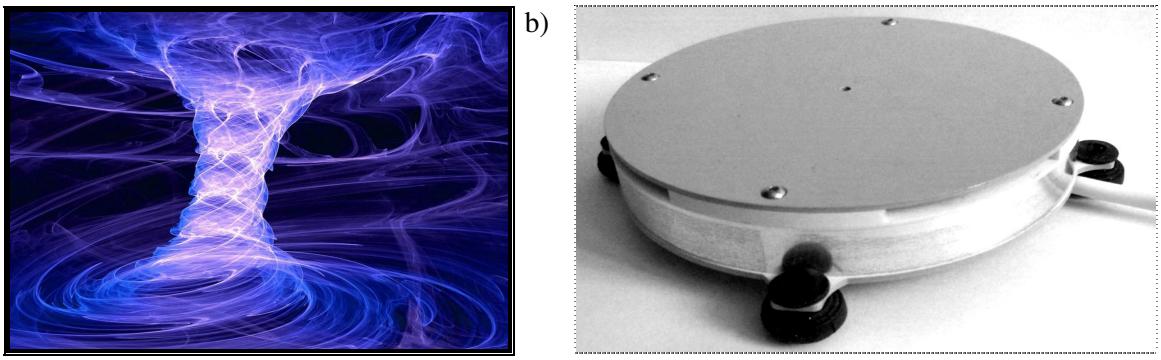

Fig. 1. **Kozyrev's heavy particle generator:** a – graphical model of the vortex; b – general view of Kozyrev's heavy particle generator

The order of carrying out of experimental researches:

1. Determination of the basic parameters of the Lithium-ion battery18650 without the influence of the KHPG was carried out using the BTS-2004 measuring apparatus in the capacitance measurement mode (Fig. 2). The device provides the parameter measurement for the discharge current, charge current with automatic maintenance of the charge according to the program, charge and discharge time, as well as automatic calculation of the battery capacity and measurement of internal resistance.

Fig.2. **Measuring apparatus: battery tester - charger/discharger BTS-2004**

The main parameters of the Lithium-ion battery 18650 without the influence of the KHPG are presented in Table 1.

Table 1

Characteristics of the Lithium-ion battery 18650

Producer	Samsung	Discharge currentstd., A	2.2
Model	ICR18650-22F	Charging method	CC/CV
Capacity,mAh	2200	Charge currentstd., A	1.1
Voltage nom., V	3.6	Outputs for installation	no
Discharg ecurrent max., A	4.4	Charge temperature	-10-50
Charge current max., A	2,2	Operating temperature	-20-70
Capacity min. (mAh)	2150	Dimensions, mm	65 x 18.4
Voltage max., V	4.2 ± 0.05	Weight, gr	50
Voltage min., V	2.75	Guarantee, m	n/g

Table 2

Discharge characteristics of the Lithium-ion battery 18650

Characteristics	**Discharge current**				
	1C	5A	10A	15A	20A
Energy, Wh	10.44	10.27	9.98	9.66	9.33
Average voltage, V	3.53	3.48	3.39	3.31	3.24
Capacity, Ah	2.953	2.950	2.945	2.917	2.879
Temp, ºC	33.7	41.0	60.9	81.2	99.4
Time, minutes	59.1	35.4	17.7	11.7	8.6

Table 3

Measured parameters of Lithium-ion battery 18650

Type		INR18650-30Q
Chemistry		NCA
Size (mm)	Diameter	18.33 ± 0.07
	Height	64.85 ± 0.15
Weight (g)		45.6
Initial IR (mΩ AC 1 kHz)		13.13 ± 2
Initial IR (mΩ AC (10A-1A))		19.94 ± 2
Rated voltage (V)		3.61
Charging method (100 mA cut-off)		CC-CV (4.2 ± 0.05B)
Charging time	Standard (min), 0.5C	134 min.
	Fast (min), 4A	68 min.
Charge current	Standard current (A)	1.5
	The maximum current (A)	4.0
Discharge	The final voltage (V)	2.5
	Max. Prod. current (A)	15
Nominal charge power	Standard (mAh) (0.2C)	3.040
	Rated (mAh) (10A)	2.983

Determination of the main parameters of the Lithium-ion battery18650 under the influence of the KHPG was carried out with the help of the BTS-2004 measuring device.

Results and discussion

During the tests, a steady increase in the capacity of the Li-ion battery was detected and fixed (Fig.3). With the parameters of 2600 mA h Li-ion batteries treated in the KHPG flow increased the capacity to 3600 mAh. These were batteries provided by the customer and not marked by the manufacturer. Such accumulators were selected from the general composition by the criterion of internal resistance not higher than 80 mΩ. In the course of studies with Kayo batteries, an increase in the capacity from 2600 mAh to 3400 mAh was obtained (Fig. 4).

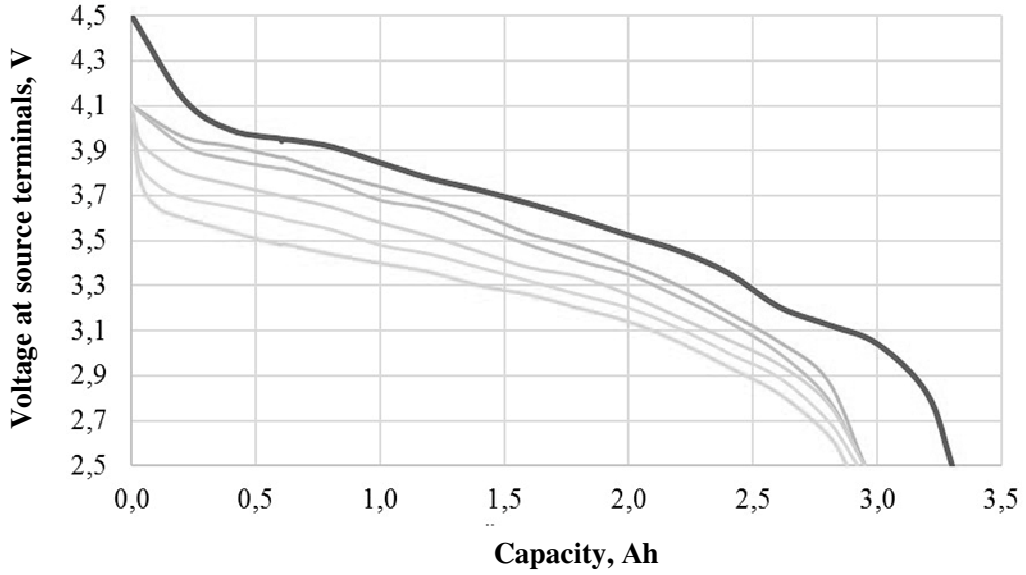

Fig. 3. **Discharge characteristic of the Lithium-ion battery 18650after exposure to KHPG**

Table 4

Experimental data after exposure of KHPG

No.	*U*	*I*	*C*	Time
1	4.5	1.993	0	0
2	4.130	1.993	0.209	00:07:58
3	3.993	1.999	0.400	00:13:41
4	3.955	1.993	0.599	00:19:39
5	3.945	1.998	0.602	00:19:44
6	3.953	1.997	0.611	00:20:00
7	3.920	1.997	0.800	00:25:41
8	3.848	1.993	1.000	00:31:39
9	3.778	1.995	1.201	00:37:39
10	3.726	1.998	1.400	00:43:36
11	3.666	1.993	1.601	00:49:37
12	3.598	1.998	1.801	00:55:36
13	3.525	1.997	2.000	01:01:33
14	3.456	1.998	2.201	01:07:32
15	3.357	1.998	2.400	01:13:31
16	3.206	1.997	2.605	01:19:36
17	3.128	1.997	2.800	01:25:24
18	3.042	1.997	3.000	01:31:26
19	2.820	1.993	3.200	01:37:25
20	2.500	1.993	3.300	1:49:01

When exposed to the Kozyrev's heavy particle generator, the internal resistance of the Lithium-ion battery 18650 decreases. This has a positive effect on increasing the recoil current without excessive heating of its body. As it can be seen from Fig. 4, the increase in the battery capacity is 10-30 %, which is an important indicator of increasing the autonomy of electric vehicles.

The graphical results shown in Fig. 3 and 4 are based on numerous studies using modern methods [3].

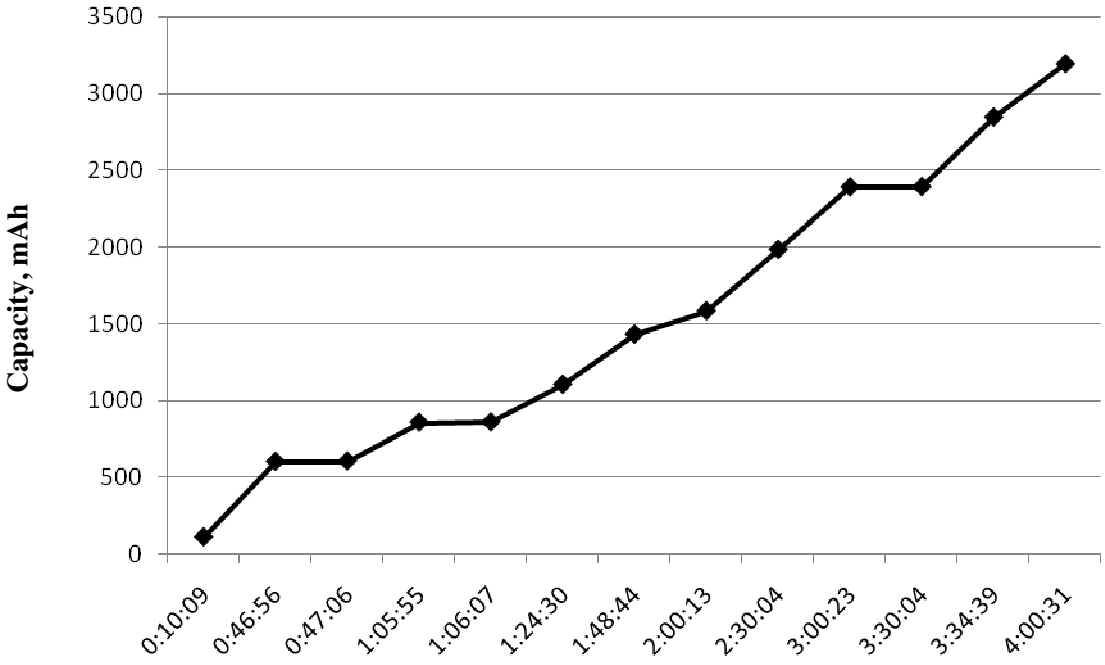

Fig. 4. **Dependence of the change in the capacity of the Lithium-ion battery 18650 on the time of action of KHPG**

Research in this subject area was conducted in 2017-2019 and is currently ongoing. These studies are based on the theoretical foundations and principles of modern fundamental science [9-17].

Conclusions

On the basis of experimental studies of the impact of KHPG on Li-ion batteries, the following preliminary conclusions can be reached:

1. The innovative characteristic of the proposed technical solution is the technological effect of the energy-informational field created by the generator of heavy particles on the main indicators of Li-ion batteries.
2. Research has found that when exposed to KHPG, the parameters of the Lithium-ion battery 18650 change, affecting the discharge characteristic. The nature of changes in the parameters of the Lithium-ion battery 18650 is consistent with the fundamental principles of quantum physics. In this regard, a scientifically-based hypothesis is proposed that when a generator of heavy particles acts on objects (liquids, colloids, etc.), a stable angular momentum of the amount of motion occurs, creating an electromagnetic field around it, and it is considered as a reserve of energy. The phenomena occurring in the processing object do not contradict the fundamental laws of energy conservation.
3. The physical nature of the phenomena occurring and the identified relationships are described using the laws governing the electromagnetic field. The mathematical formulation of the field laws is given in Maxwell's equations. The effect of these laws applies to all space, not only the points at which the substance is or the charges. A small electrically charged sphere under the influence of external forces makes rapid and rhythmic vibrations. An oscillating charge radiates energy that propagates in a limited space at a certain speed, changing the technological properties of the substance. Thus, the tested system is characterized by spontaneous activity caused by instability of the non-equilibrium state, which comes as a result of interaction with the energy-informational field.
4. When the generator of heavy Kozyrev particles is exposed to Lithium-ion batteries, their internal resistance decreases, the efficiency of electrochemical processes occurring in the batteries increases, and their main indicators improve. The results of preliminary experimental studies indicate a significant (10-15 %) increase in the capacity of the Lithium-ion battery18650, which, for example, will positively affect the power reserve of electric vehicles. The advantage of batteries exposed to KHPG is also to reduce the environmental burden on the environment.

5. To correctly assess the mechanism of influence of the Kozyrev's heavy particle generator on the parameters and characteristics of various objects, it is necessary to conduct further comprehensive research. Laboratory tests of GTCHK on organic raw materials (seeds of grain crops with humidity $W = 14$ %) showed positive results. However, it is too early to interpret them meaningfully. It is planned to conduct research in economic conditions on grain material with field humidity ($W = 18$-26 %).

References

[1] Pohjalainen E., Rauhala T., Valkeapää M., Kallioinen J., Kallio T. Effect of Li4Ti5O12 Particle Size on the Performance of Lithium Ion Battery Electrodes at High C-Rates and Low Temperatures. J. Phys. Chem. C. 2015, vol. 119, pp. 2277-2283.
[2] Zou H. L., Xiang H. F., Liang X., Feng X., Y. Cheng S., Jin Y., Chen C. H. Electrospun Li3.9Cr0.3Ti4.8O12 nanofibers as anode material for highrate and low-temperature lithium-ion batteries. J. Alloys and Compounds. 2017, vol. 701, pp. 99-106.
[3] Plichta E. J., Behl W. K. A low-temperature electrolyte for lithium and lithium-ion batteries. J. Power Sources. 2000, vol. 88, pp. 192-196.
[4] Kerimov M. A, Safiullin R. N. The theoretical bases for the integrated optimization of the main variables and parameters of the internal combustion engine of the ATS in the application of fuels of different ICE quality, 2014, Journal (Russ. Lang.) "Bulletin of civil engineers", vol. 4(45), SPbSABU, pp.104-111.
[5] Kerimov M. A., Safiullin, R. N. Methods of evaluation and implementation of fuel quality indicators based on the study it's hematologicall processes and properties, 2014, Journal (Russ. Lang.) "Bulletin of civil engineers", vol. 3(44), SPbSABU, pp. 184-188.
[6] Kerimov M. A., Safiullin, R. N. Development of software for adaptive control systems to assess and implement sustainable quality indicators of used fuels], 2014, Journal (Russ. Lang.) "Bulletin of civil engineers", vol. 2, SPbSABU, pp. 121-126.
[7] Degtiarev K. Y. Prototype-based categorization of structural complexity estimates of simplical complexes// in: Proceedings of the 10th International Conference on Application of Fuzzy Systems and Soft Computing (ICAFS-2012). Kaufering: b-Quadrat Verlag, 2012. pp. 27-37.
[8] Denisov A. A. The information field, SPb.: Omega, 1998, pp. 64.
[9] Denisov A. A. Theoretical bases of Cybernetics, L.: LPI, 1975, 40 p.
[10] Hilmard D. Fuel efficiency of vehicles with petrol engine/ edited by D. Hilmard (translation from English) M.: Mashinostroenye, 1988 p.
[11] Makerle, Ju. Modern economical car/ Ju. Mackerle; (transl. fromCzech lang.) M.: Engineering, 1987.
[12] SAE J3016. Standard: Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automatic Driving Systems. Issued: 2014-01-16 – SAE International Inc., 2014.
[13] Denisov A.A Longitudinal striction waves and the "Great Unification". SPb: OOO "RPA Omega". 2001.4 p.
[14] Denisov A.A. Fundamentals of Electromagnetism. (Unified Field Theory). Publishing House "RYUI".2000. - 34 p.
[15] Kosyakov B.P, Introduction to the classical theory of particles and fields. M.-Izhevsk: NIC "Regular and chaotic dynamics"; Institute of Computer Science.2017. 656 p.
[16] Yost R. The basis of the theory of quantum fields. Trans. from English. Moscow: Mir, 1967
[17] Schwartz A.S, Mat. Fundamentals of quantum field theory. Ed. 2 -st. - Moscow: Lenand. 2017. 376p.
[18] Kuzelev M.V. Wave phenomena in media with dispersion. Moscow: Lenand, 2017. -400 p.
[19] Weinberg S. Quantum field theory. T. 1. General theory/Trans. from English. Ed. By V. Ch. Zhukovsky.-M.: FIZMATLIT, 2015. 648 p.
[20] Krainov V.P, Smirnov B.M Quantum theory of radiation of atomic particles: Textbook/VP Krainov, BM Smirnov. - Dolgoprudny: Publishing House "Intellect". 2015. 296 p.