Recycle rechargeable lithium - ion batteries

Stela Todorova, Mladen Proykov
University "Prof. d-r Asen Zlatarov", "Prof. Yakimov" bul, 8010 Burgas,, Bulgaria
rector@btu.bg

Abstract: *Milliards of dollars are set aside for preserving the life on planet Earth and help climate change. Unfortunately, the advances in technology are incapable to help us sort out this vital problem, because the more advanced the technology nowadays is, more irresponsible we become in taking care about consequences after the expiration date of it. It is not only the plastic pollution of ocean of our planet that stops the formation of oxygen but also the irresponsible disposal of lithium-ion rechargeable batteries for smartphones, tablets, computers, electric smart devices and vehicles that are no longer in use, create ionizing radiation and form a radioactive background that affects living and non-living organisms inhabiting our planet. So, when the technology cannot help us, then perhaps the pure science would come to the rescue of preserving ourselves. There are laboratory researches about recycling lithium-ion batteries and here where we are – we are going to implement mathematics, algorithms, indexed arrays(vectors) for describing the benefit of manufacturing the recycling of lithium-ion batteries.*

Keywords*: RECYCLING, BATTERY, ELECTRIC CAR, ELECTRICITY*

1. Introduction

Bodies in nature are divided into three groups or categories:

1) Radioactive (RA) forms, which contain positive and negative electricity, forming atomic bombardment, which, hitting the ether, gives constant waves;

2) Forms that contain only positive electricity;

3) Forms that contain only negative electricity.

Based on categories 1), 2) and 3), Louis Turenne created detectors for each one of 3 groups:

1. Normal radioactive detector;
2. Detector (minus) - (negative);
3. Detector (plus) - (positive);

Using these three detectors and applying his theory of wave propagation, he was able to find out that all radioactive forms emit constant waves and that the forms of the second and third groups, placed under certain conditions, also emit waves, but they are not constant, which he called pendulum /static/ waves.

Also, engineer Louis Turenne was able to graphically trace the spectra of these static waves, when it is impossible to study the spectrum of constant waves, which are excessively short, node to node and practically represent continuous straight lines. [1]

Tesla and other scientists speculated that electric and magnetic forces were actually streams of ether that is fixed in matter. Materials are somehow "polarized" by "rubbing" as the ether passes through them. Most substances maintain the flow indefinitely because it does not make them work. It is enough for matter to simply remain polarized in order to conduct the flow of the ether. [2]

According to these theories it is possible to conclude:

Conclusion N 1: All radioactive bodies emit constant waves - Wave that results from impacts on the ether, with a uniform frequency, and as a result of mechanical, electrical, magnetic, atomic or other bombardment. These waves are also known by the radio as carriers.

Conclusion N 2: All other forms emit static waves, which the detectors will encounter in the form of spheres or ellipsoids, which are usually 4 groups, one after the other and are repeated in the 4 perpendicular directions in which the constant carrier wave propagates. The wavelength of each group is L and consists of 4 ellipsoids. For the 4 groups in the direction of the carrier wave will be L, 2L, 3L, 4L. The four concentric spheres or ellipses have wave heights h, 2h, 3h, 4h, respectively. An abbreviated image of a static wave can be represented by knowing the direction of the (+) or (-) wave and the value of the first h and L.

Louis Turenne draws the following conclusion after many experiments: mechanical or atomic shock waves follow the same laws and create the same constant waves as those of mechanical waves created by a metronome, whose length increases as the frequency of shocks per minute decreases. Louis Turenne draws another important conclusion that the waves that are measured appear to be harmonic to the waves measured in μ.

On the other hand, in physics, the wavelengths of colors in μ are set, as well as their frequencies in billions of kilocycles, the wavelengths of which are given in Table 1. [1]

Table 1. *Measuring scales. [1]*

Measuring scales	**Value 1**	**Value 2**	**Value 3**	**Value 4**
Colours	Red	Yellow	Green	Blue
Length in μ	0.64	0.56	0.52	0.48
Frequency in billions of kilocycles	380	520	580	640

2. Lithium-ion battery and principle of operation

Nowadays, the lithium-ion battery is one of the most popular types of batteries in portable electronic devices - electric cars, laptops, smartphones, tablets and other portable devices. The three main functional components of a lithium-ion battery are the anode, cathode and electrolyte, for the manufacture of which different materials can be used. The most popular material for the anode is graphite. [3]

Fig. 1 shows a three-dimensional image of the grid of the cathode, where the atoms of the chemical elements are represented as vertices of a polyhedron - 3-Dimensional figure, which are used to make it, and the covalent bonds that exist between the chemical elements are represented as sides of the polyhedron.

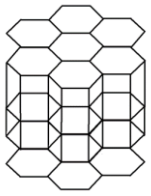

Fig. 1 *Three-dimensional image of the grid of the cathode.*

Therefore, we can present a fixed graphical structure of the vertices of a single component of the cathode in one of the three planes – x-z plane of a 3-dimensional coordinate system, which is illustrated in Table 2. The presence of atoms of chemical elements involved in the construction of grid of cathode are marked with '1' and their absence with '0'.

Table 2. *A single component of the cathode in one of the three planes – x-z plane of a 3-dimensional coordinate system.*

Plane	$\mathbf{x_1}$	$\mathbf{x_2}$	$\mathbf{x_3}$	$\mathbf{x_4}$
z_1	0	1	1	0
z_2	1	0	0	1
z_3	0	1	1	0

3. Conditions and prerequisites for the transition of ions of a lithium-ion battery

A lithium-ion battery (popularly known as Li-ion) is a type of rechargeable battery in which lithium ions move between the two electrodes. When charged, the ions move in the direction from the positive to the negative electrode, and when discharged - from the negative to the positive electrode. [3] It is possible to determine the time – t needed for one ion or multiple set of ions from positive electrode to reach the negative electrode or vice versa. In this way, a complete timing diagram for charging and discharging a lithium-ion battery can be recreated. In Fig. 2 is illustrated functional scheme of lithium-ion battery.

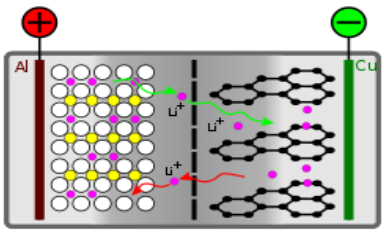

Fig. 2 *Three-dimensional image of the grid of the cathode.[3]*

4. Lithium-ion battery recycling with fungi

The idea of recharging lithium-ion battery is to decompose the components of grid structure of the Cathode by organic acids that some fungi can produce. There are researches that microbes or fungi can produce organic acids that may help leach out valuable metals [4]. Scientists give ideas about how to remove cobalt and lithium from the acid produced by fungi or microbes. [5]

The first step for recharging lithium-ion batteries is construction of facility where Lithium rechargeable batteries will be stored and will be recharged and recycled by organic acids produced by fungi. As a result of recycling of Lithium rechargeable batteries, there we will have an environment without radioactive waste.

When we have the facilities, then we can collect Lithium batteries and transport them to the facilities.

Table 3 presents the atomic wavelengths of some fungi.

Table 3. *Atomic wavelengths of some fungi. [1]*

Name of funji	**h**
Amanita muscaria	13
Amanite phalloïde	13
Amanita citrina	13
Amanita pantherina	13
Amanita verna	13
Amanita jacksonii	62
Thick amanita	50-55
Cortinarius	50-55
Dandruff	50-55
Porcini Yellow	50-55
Chanterelle Orange	50-55

5. Conclusion

As a result, the height - h and the length L of radiation of static waves can be determined for each living and non-living being. Engineer Louis Turenne also makes a detailed table with values of height - h and length L of radioactive waves that different fungi emit in nature and if the upper limit of waves emitted by a lithium-ion battery coincides with the lower limit of radioactive wave emitted by a sponge and vice versa, resonance will occur and it would be possible to recycle radioactive waste in the form of unused batteries. At a time when the air is polluted by increased carbon emissions and as a result of the replacement of cars internal combustion engine with electric cars, it will lead to production of many batteries for electric cars, which at some point in the future will need to be recycled - a problem which Elon Musk should think about.

6. References

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