

SODIUM CHLORIDE SOLUTIONS STRUCTURING IN THE TRIDIMENSIONAL MAGNETIC DEVICE

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Abstract: Using a special electro-magnetic device, we can study the crystallizing manner of different liquid chemical substances. The novelty comes from the magnetic field's composition manner, similar to the studies of Japanese physicists Syou Maki and Mitsuo Ataka. These researches are pioneering this activity field, the field generated by the experimental device designed in a private laboratory in Romania being called electro-dia-magnetic structuring field. For pointing out the crystallization manner, the samples are studied using an optical microscope endowed with digital camera. The controlled crystallization patterns pointing out and statistic analysis, according to exposure period, indicated a new study manner that could expand the material technologies possibilities.

Keywords: magnetism, electro-diamagnetic field, diamagnetic structuring environment, sodium chloride crystallization

1. INTRODUCTION

1.1 International studies about water solutions structuring in magnetic field

Two physicists from the Institute of Science and Technology from Ikeda, Japan - Syou Maki and Mitsuo Ataka, performed an experiment managing to create a predefined structure in water, using high intensity fields - 10 T. The physicists provoked an arranging in water's liquid structure using an older technology for which were used high power magnetic inductors in order to generate on Oz axis a more pronounced diamagnetism (Fig.1) – six coils ordered two by two one in front of another and the three pairs perpendicular between them.

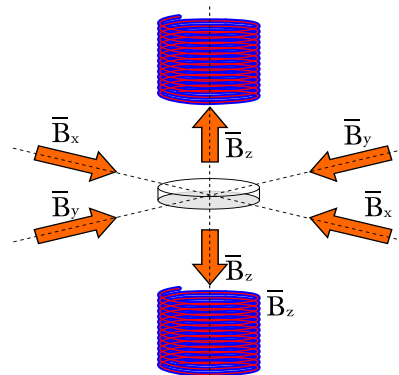


Fig. 1: The arrangement on the three axes Ox, Oy and Oz of 6 induction coils placed one in front of another. An exception is for the coils on axis Oz, where magnetic polarity is inversed.

According to researchers explains, the water's internal structure suffered often mutations of the structuring direction according to magnetic field's intensity. Ulterior mathematic analysis of the experimental data pointed out the transformations appeared in time. For a low intensity magnetic field, the water molecules orientation vectors are arranged on the field line crossing the water cassette. The water structure's changes are significant when increasing the magnetic field up to value of 10 T.

In a study issued by S. Kobe, S. Novak and co-workers, referring to the behavior in solution of calcium carbonate, over which it is applied a magnetic field, it is pointed out the fact that structural changes are not special comparing to other physical or chemical procedures. Using a magnetic field with 0.5 – 1.5 mT, they intended to study solutions crystallization manner in comparison with the crystallization without magnetic field. The observations pointed out the fact that the major changes brought by the magnetic field are to generate an increase of nucleation number in solutions and changes in crystals sizes.

The studies issued by S. Kobe, S. Novak and by the physicists Syou Maki and Mitsuo Ataka are justifiable for using magnetism for the researches referring to water solutions crystallizing, as component part of present researches about self-structuring.

1.2 Electro-dia-magnetic structuring field

Using the hypothesis of a certain electrons liberty in a well defined volume in a diamagnetic material – it is supposed that if we use two opposed oscillating magnetic fields, we could create a special electro-magnetic trap for atoms or molecules. Taking into account that it was intended the simulation of diamagnetism phenomena, we called this new type of manifestation of electro-magnetic field as electro-dia-magnetism (acronym - EDM). According to mathematical formulas determining the magnetic couples in substance, when appearing two opposed magnetic fields, there could not exist any resulting magnetic vector, so we could say it exists a classical magnetization phenomena.

According to cuantic electrodynamics specialized literature, two magnetic fields annul themselves reciprocal. Still, when passing through substance two magnetic fields, it is possible the effects to be different from zero. In vacuum, two magnetic fields can orient and compose in an ideal manner, but in matter, the effects of magnetism could create significant changes in its intimacy.

The magnetic force appearing in a mass of material (following the experimental study) has the value:

$$F = \frac{\rho\chi}{2\mu_0} B^2,$$

where F – the magnetic force generated in the solution, ρ - the solution's density, χ - the magnetic susceptibility for a mass m , μ_0 - the magnetic permeability in vacuum and lastly B is the magnetic induction generated by the device. According to the work hypothesis and to induction coils special construction, the induction's value is dependent on the constructive and position (orientation) variables. So, on Oz axis, the magnetic induction's proposed formula is:

$$B = \frac{\mu_0 \cdot N \cdot i_0}{2} \cdot \frac{1}{\sqrt{L^2 + r^2}} \cdot [\sin(\omega t + \varphi_1) - \sin(\omega t + \varphi_2)],$$

where N – number of spirals of the induction coils on Oz axis, i_0 – the electrical current's intensity passing the coils, L – the coils length, r – the coil's radius, t – the time, φ_1 and respective φ_2 - the specific phase shifts for the electrical current's oscillations in the two coils on Oz axis and ω - the variable electrical current's pulsation. The above magnetic induction's formula is valid only for the coils specially built for this study, where it was intended that coils dimensions and constructive characteristics to be in concordance with the value of electrical current's oscillation passing through the spirals.

The such built device is part of an ample study program of Vortex Energy Project (acronym PEV) – the assembly built for this study having the indicative PEV II - P01.

2. MATERIAL AND METHOD

2.1 Study Material

For pointing out the salted solutions concrete crystallization manner and in the same time to perceive the changes appeared during using different outer medias or different characteristics of PEV generation device, there were elaborated some experimental studies for clarifying the working manner, the device's characteristics, the perception limits of the used solution and the influence of outer environment over the observations referring to

salt crystals final shape. According to these experiments, there were elaborated study protocols, the concrete working manner, the use of laboratory tools and the final comparative analysis manner.

So, during the 7 experimental sessions, it was analyzed a table water solution (bought from the shop) with salt (NaCl - 5%), noted ASC.

The solution of water with salt structured in PEV device is still noted using the indicative ASP.

2.2 Study Method

The water with salt solution is charged in PEV device for a certain period of time and then, using a graded dropper, there are placed four drops of this solution in Petri capsules, being dried at constant temperature of 27°C. The final study is based on the observation with the microscope of salted solutions crystallization manner. The system is endowed with a mini-camera with specialized software for PC, the used software being Ulead Video 7 SE. The mini-camera can make pictures with the resolution of 1024 x 768 pixels. The digital increase capacity is 10x, maintaining the microscope's objective of 10x. Salt crystals effective increase within this study was made up to – enough to point out the effective shape and structure characteristics. For maintaining the observations results, there were not applied other images processing manners that the ones offered by the digital camera, maintaining the offered maximum luminosity.

3. STUDIES AND EXPERIMENTAL RESULTS

3.1 Studies over crystallization differences

The salts crystals structured magnetic three-dimensional have a different aspect comparative to natural crystallization. The sample in Fig. 2b was treated originally for 3 days in PEV II device. The ASP crystal has a marked octagonal shape. Also, at ASP sample, it is observed that around the crystals, there are no salt amorphous fields, as in case of ASC - Fig. 2a – we could say the entire salt mass crystallizes ordered. As an important difference, for ASP crystals, it is observed a tendency of crystals sizes decreasing and a nucleation increasing.

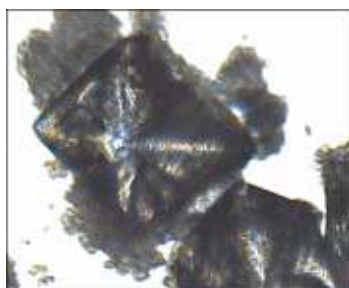


Fig. 2a: ASC crystal tends naturally to crystallize in cubic shape. Due to the presence of other metal ions, there is a certain not crystallized mass around salt formations



Fig. 2b: Special crystallization under the incidence of structuring field EDM. The structure is seen only for ASP solutions treated in PEV II device

3.2 Crystallization difference according to the charging period of time

According to the studies, there is a difference in the crystallization manner according to the period of time ASP stays in PEV device. As a principle, after 3 charging days, it is observed a significant difference comparative to ASC witness sample (Fig. 3a). Irrespective to the time allocated to PEV device, ASP crystals tend to have shapes with rounded corners (Fig. 3 b), triangle (Fig. 3 c), octagonal (Fig. 3 d) or mixed of such shapes.

The studies were carried every 3, 5, 7, 11 and 15 days of continuous charging, without visible structure changes to the crystallization manner of three consecutive days. Still, after more than 3 charging days, it is remarked a difference between ASP layers in the recipient subjected to the study.

So, there is an evaporation tendency greater for the 6 days ASP sample taken from the upper side of the recipient comparative to a sample taken from the lower part, observation repeated also for samples of 7, 11 and 15 days. It is observed a significant difference between salt crystals shapes and sizes in the upper and lower part of the recipient placed in PEV device.

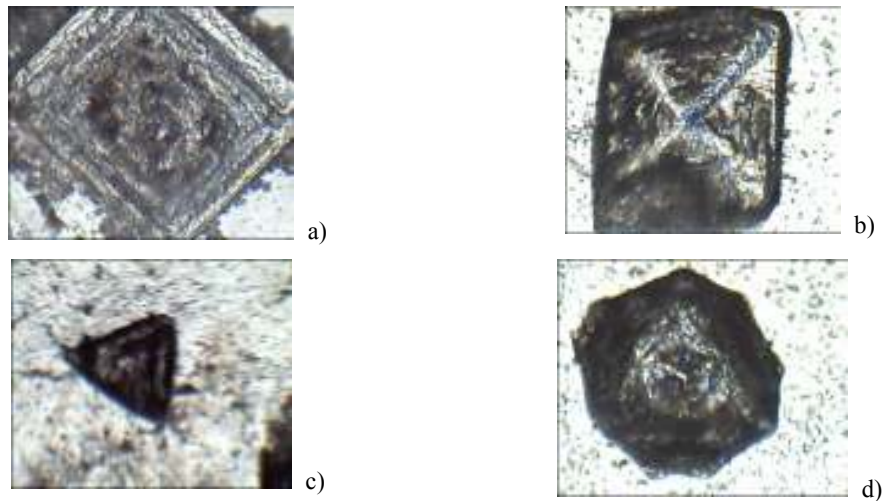


Fig. 3: Crystalline structures observable when charging in PEV device.

In the upper part, it is remarked a crystallization tendency with transparent structures and apparently ordered, explained by the existence of a greater water purification and of the salted solution (Fig. 4 a). In the lower part, it is observed the crystallization with small, non-homogenous shapes, without brightness and a more amorphous area (Fig. 4 b). This situation is explained by the fact that in the lower part of the recipient accumulates a significant mass of salts or impure compositions, compounds of Ca or Mg etc.

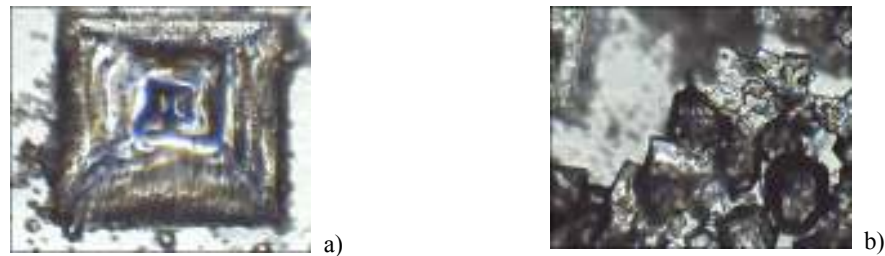


Fig. 4: Salt structures formed in distinct areas in the recipient placed in PEV device. The arranged and ordered structure corresponds to the upper side of the recipient (a) and the disordered structure corresponds to the lower part of the recipient (b)

Due to multiple observations, it was checked the crystallization manner of the sample from the middle of the recipient subjected to the field in PEV device and it was remarked the difference both in crystals sizes and in their specific forms. In the middle area (on the axis of maximum EDM field), it is remarked the abundance of rounded, triangle or octagonal type crystallization shapes and crystals sizes are significantly smaller. It is observed the lack of amorphous material and it is remarked the crystals special brightness. As a principle, for 5, 7 and 11, it is observed the quicker evaporation phenomena, different crystallization structures, different sizes between the three layers of the recipient and crystals different shapes.



Fig. 5: Crystalline structures found out in the three parts of ASP solutions (a-middle, b - upper, c – lower)

After more than 11 days, for the ASP solutions charged in PEV device, it is remarked a change in the structuring manner. The crystallization manner specific for the middle area (Fig. 3 b, c and d - Fig. 5 a) imposes more and more in the entire solution mass subjected to EDM field (Fig. 5 b – upper sample, Fig. 5 c – lower sample). So, in the upper side of the recipient, there are formed hybrid crystalline structures, looking alike the upper and middle part (Fig. 5 b). In the lower part, there are formed crystals looking alike the ones already observed during the other working sessions, coming from the lower part but tending to order as the middle sample (Fig. 5 c). ASP frequent crystallization is hexagonal, octagonal and combination of it. After about 11 days, appears the tendency that the lower and upper part to show shapes mostly hexagons / octagons or simply, rounded shapes.

3.3 Stability of salted solution internal structure structured in EDM field

There is a capacity of maintaining in time the ASP internal structuring and arranging manner even it was taken out from the PEV device. It was pointed out the maintaining of complex crystallization shapes observable in Fig. 3 b, c, d and Fig. 5 even after 14 and 28 days after taking out the salted solution recipient from the device (after 15 consecutive charging days). This fact demonstrates that ASP internal structure can maintain its charging shape for a long time (Fig. 6 a, b, c, d).

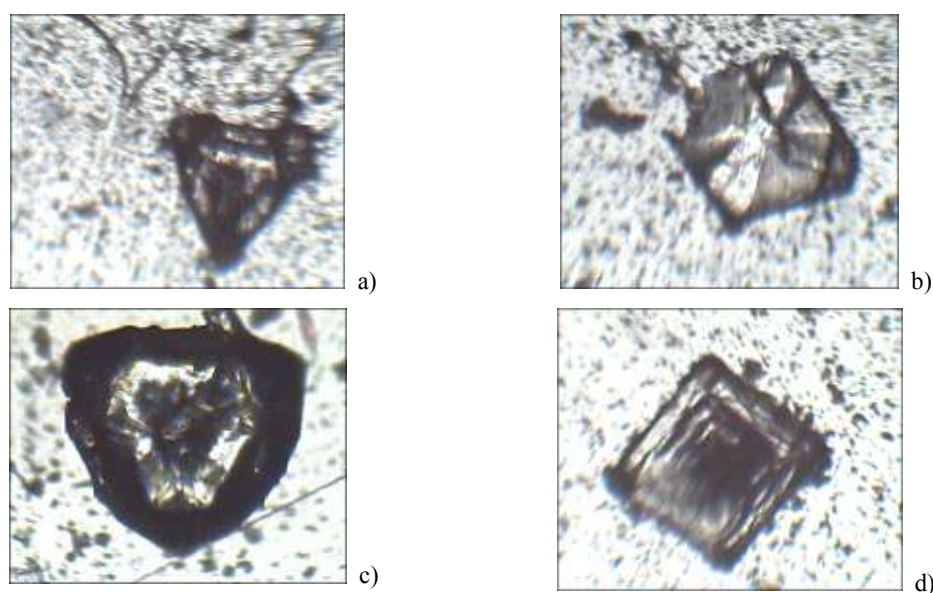


Fig. 6: Crystalline structures observable after 14 days from charging in EDM field of PEV II device.

4. FINAL CONCLUSIONS AND FUTURE STUDIES

The changing capacity of salted solutions internal structure of PEV II device is remarked clearly by different crystallization structures observed both visual, by arrangement's macro shape and by micro structure micro observable at the microscope, analyzing the crystallization shape of different charging manners. By EDM field's nature, there are formed crystallization germs that could not depend exclusively on water solution's nature. This hypothesis appeared due to the studies when it was charged simple tap water, from the shop or even distilled water, in PEV device and afterwards it was mixed with salt and left for 3 days for homogenization. It is observed the same structuring tendency as for the studied salted solution - ASC. This fact demonstrates that PEV device acts the same through the generated EDM field, the crystallization difference depending on the charging period of time. So, the crystallization manner depends mostly on the structure of the field generated by PEV device, depending on induction coils emission power, on the working frequency and time. Still, there are differences in the chemical solution's nature by the fact that the solution's purity can hurry or slow the structuring process. Finally, irrespective of the chemical solution's purity, of the power or exposure period of time, PEV device can generate enough force to structure the chemical solutions.

Taking into account this study, panning out PEV general properties, it is necessary to experiment the structuring manner for different chemical solutions in EDM environment. In the following experiments, we will use more chemical solutions: salt, sugar, sodium bicarbonate, calcium carbonate etc., in several successive study phases:

natural crystallization, crystallization after exposure to a static magnetic field, structuring in an electro-magnetic field and than crystallization after structuring in PEV II device. Also, there will be elaborated the experiments in order to be stipulated for every study three consecutive periods of time (sampling daily, every three to five days for crystallization in neuter, magnetic, electro-magnetic environment and structuring in PEV device). Additionally, we will use three concentrations of chemical solutions, even if during the experiments with salt, it was not remarked a significant difference. It is possible that for other chemical solutions to count the saturation degree with ionic compounds.

Another aspect that created major problems is the mathematical processing of EDM field. From this reason, for the future studies, we will create and build a device that could generate simple EDM structures that can be approximated by mathematic calculations. For this aspect, we will create specialized software for increasing the accuracy of EDM generated field and a better control of the phenomena. Also, it is necessary for the device to generate frequencies from some Hz to hundreds of Hz. This start is necessary for creating a minimum mathematical evaluation of EDM field's composing manner and to open a new way of structuring the matter, through minimum consumed power and maximum results.

The analyses and future observations are important for the international technological context for this structuring manner can help successfully the silicon controlled crystallization studies, the domestic and industrial water purging manner, the Romanian chemical research development and not lastly the biological and medical Romanian researches. Salted solutions capacity of maintaining their structure in time minimum 28 days (checking time) can open new concepts about matter's memory, about self-structuring capacity and has chances to support the hypothesis of using fractal mathematics in future technologies.

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