

The comparative analysis of the Optical Density for MRET activated water and non-activated water in visible, ultraviolet, and infrared regions of the spectrum

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Documents/RA0054.pdf](http://jresearchbiology.com/Documents/RA0054.pdf)**ABSTRACT:**

MRET activated water is produced with the help of the USA patented Molecular Resonance Effect Technology (MRET). The anomalous electrodynamic characteristics (dielectric permittivity and electrical conductivity) of MRET water subjected to applied electromagnetic field in the area of very low range of frequencies and the anomalous viscosity of MRET water subjected to very low tangential pressure have provided some evidence for the long range dynamic polarized-oriented multilayer structuring of such activated water .

The objective of this article is to demonstrate the relatively high, long range dynamic structuring of water molecules in activated water produced with the help of the MRET activation process. To achieve this goal there were conducted a number of the comparative analysis of the optical density for MRET activated water and non-activated water in visible, ultraviolet (UV), and infrared (IR) regions of the spectrum. This analysis confirms that MRET activation process has the tendency to force water molecules to form large size clusters in the volume of water.

Such findings provide some evidence that MRET activation leads to the formation of polarized-oriented multilayer structuring of water molecules. The correlation analysis of the scattered laser emission also provides the unambiguous confirmation of the presence of the stable water memory phenomenon. The duration of water memory phenomenon was observed for many hours and days in this particular experiment. The water memory phenomenon can be interpreted as the existence of stable super-molecular clusters in the volume of activated water.

Keywords:

optical density, electrodynamic characteristics, viscosity, polarized-oriented.

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INTRODUCTION

MRET activated water is produced with the help of the USA patented Molecular Resonance Effect Technology (MRET). The MRET water activator is the stationary source of a subtle, low frequency, resonant electromagnetic field with a composite structure. The origin of low frequency composite electromagnetic field is the intensive electrical activity inside nano-circles formed by linear molecular groups of MRET polymer compound (volumetric fractal geometry matrix) when the polymeric body is exposed to external electromagnetic fields of specific frequency and wavelength. Research conducted at Moscow State University, Russia provides evidence that distilled water after MRET activation process possesses anomalous physical properties (dielectric permittivity, electrical conductivity and viscosity) compared to distilled non-activated water from the same source.

The electrical conductivity of MRET activated water at 20°C in the range of frequencies 0.1 Hz – 100 kHz decreased by 77–90% in 30 minutes activated water and by 66–70% in 60 minutes activated water compared to non-activated distilled water respectively. The dielectric permittivity in the very low frequency range 0.1–1000 Hz decreased by 80–90%, and in the range of frequencies 1–100 kHz and decreased by 18% in 30 minutes activated water; a decrease by 70–85% was observed in the range 0.1–1000 Hz in 60 minutes activated water compared to non-activated water [Smirnov, 2008].

The anomalous low viscosity of MRET activated water in the area of very low magnitudes of tangential pressure applied to the water was discovered during another experiment. The experiment revealed that at a very low velocity of motion of water (tangential pressure in the range of 0.004–0.005 Pa, temperature 20°C), the viscosity of MRET water activated for 60 minutes decreased by 200–250 times compared to non-activated water from the same source. The most significant phenomenon of anomalous low viscosity of activated water; a decrease by 300–500 times, was observed for water activated for 30 minutes [Smirnov, 2007].

The anomalous behavior of the electrodynamic characteristics (dielectric permittivity and electrical conductivity) of MRET activated water subjected to applied electromagnetic field in the area of a very low range of frequencies, and the anomalous viscosity

of MRET activated water subjected to applied tangential pressure in the area of very low magnitudes provide some evidence regarding polarized-oriented multilayer structuring of MRET activated water and the possible effect of MRET water on the proper functioning of cells in biological systems.

The fundamental biophysical theories revealed the scientific paradigm regarding polarized-oriented multilayer structuring of cell water in biological systems. The suggested model of polarized-oriented multilayer structuring of cell water due to the interaction of water dipoles with pervasive matrix of fully extended proteins constitutes the basis for the cellular transduction mechanism [Drost-Hansen et al., 1991]. Based on this scientific approach, the similarity of molecular formations of cell water and MRET activated water can contribute to their compatibility, easy bioavailability and assimilation of MRET activated water, as well as to the enhancement of cellular functions in biological systems.

The objective of this article is to demonstrate the relatively high, long range dynamic structuring of water molecules in activated water produced with the help of the MRET activation process. To achieve this goal there were conducted a number of the comparative analysis of the optical density for MRET activated water and non-activated water in visible, ultraviolet (UV), and infrared (IR) regions of the spectrum.

MATERIALS OF METHODS:

The finding of the sharp increase of the absorption of the UV emission in the region of wavelengths shorter than 190 nm is related to several mechanisms. The main mechanism in the region of the near-UV emission is conditioned by transitions in the electron subsystem of a H₂O molecule which lead to the dissociation of this molecule and the formation of the ground (non-excited) state of the system H + OH. Under the action of the emission with shorter wavelengths, the following becomes essential: the processes leading to the dissociation of molecules of water with the formation of excited molecules OH* and radicals H, as well as the radiolysis products H₂ and O. **Fig. 1** presents the results of measurements of the optical density in the region of near-UV emission for non-activated water and for MRET water activated for 0.5 hour.

The same fraction of MRET activated water (the duration of activation was equal to 30 min) was

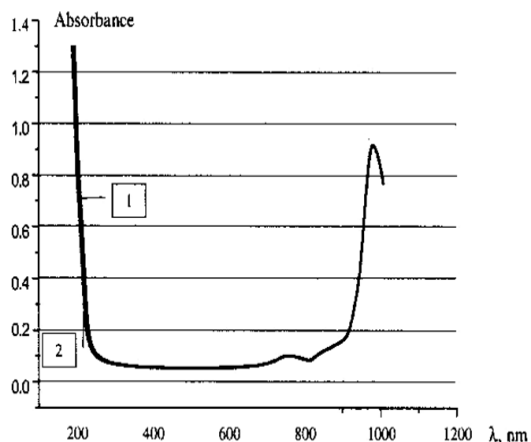


Fig. 1 Optical density of non-activated water (1) and MRET water activated for 30 min (2) versus the wavelength in the visible and UV ranges. Both plots visually coincide with each other [Vysotskii et al., 2009].

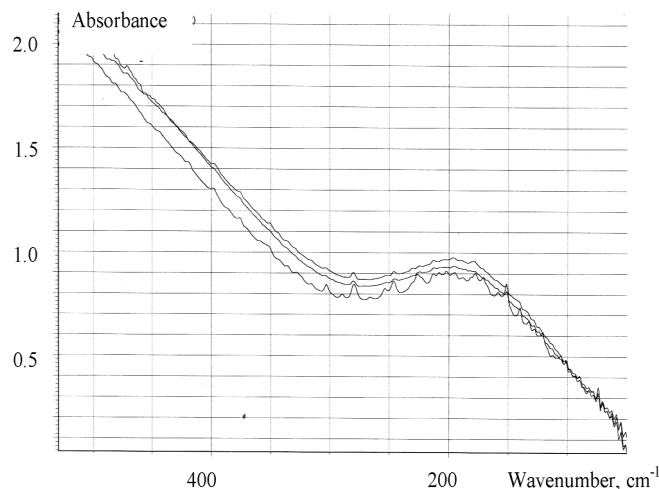


Fig. 2 IR-spectra of non-activated water (upper curve) and activated water that was studied in 5 hours after the activation (middle curve) and in 1 hour (lower curve) after the activation [Vysotskii et al., 2009].

studied by the method of infrared Fourier-spectroscopy with the help of a device “Nexus” produced by the firm “Thermo Nicolet”. The studies were performed in the range of wave numbers from 50 to 4000 cm^{-1} (Fig.3).

MRET activated water was also studied by Raman scattering spectroscopy. The Raman scattering spectra for non-activated water and for MRET activated water was studied in 24 hours after the completion of the activation and are presented in Fig. 4. The studies were performed with the same fraction of water (activation for 30 min). The spectra determine the Raman scattering characteristics in the region from 1 cm^{-1} to 4000 cm^{-1} .

With the purpose to discover the presence of structural elements in the water bulk there carried out an additional study in the optical characteristics of MRET activated water with the help of the laser correlation analyzer AKVA-01. The principle of action of this device is based on the analysis of the characteristics of a mutual temporal coherence function of the laser emission scattered in the volume of the studied water in the direction perpendicular to the initial laser beam. There was used the emission with a wavelength of $\lambda = 0.63\mu\text{m}$ generated by a He-Ne laser was used in the analysis. The longitudinal coherence length of such an emission prior to its scattering is very large and exceeds hundreds of meters. The width of the spectrum of this emission is very small [Vysotskii et al., 2009].

The laser spectroscopy measurements were

conducted on four different samples of the initial non-activated water (see Fig.5):

1. Natural Mineral Water “AVIAN” (produced in France);
2. FreshWater Life “JINBO/Seok Su” (produced in the Republic of Korea);
3. Natural Mineral Water “HAITAI/Gangwondo/Pyeong Chang” (produced in the Republic of Korea);
4. Natural Mineral Water “JEJU/Sa Da Soo” (produced in Iceland).

RESULTS:

Visually, both plots in Fig.1 coincide with each other. This corresponds to that almost no difference between the spectra of the initial non-activated water and activated one observed in the visible and UV regions of the absorption spectrum in the limits of accuracy of the method (0.5%), except for a small increase in the absorption, at most 1–2%, in the UV region of the spectrum at wavelengths near $\lambda = 190\text{--}210\text{ nm}$.

This result differs basically from the above mentioned very essential changes in the electrodynamic characteristics of activated water in the region of low frequencies. It shows that the process of activation by means of MRET activation does not lead to a significant change of the electron subsystem of atoms and involves only structural and juxtaposition changes of the water molecular system.

The results of the study in various regions of IR-spectra are presented in Figs. 2. This diagram

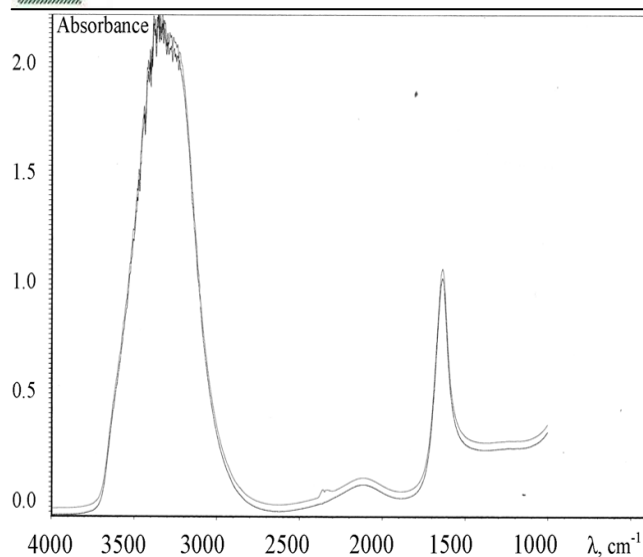


Fig. 3 IR-spectrum of non-activated water (upper curve) and water activated for 30 min (lower curve). The spectrum was studied in 1 hour after the activation [Vysotskii et al., 2009].

gives the IR-spectra in the range of $50 - 550 \text{ cm}^{-1}$ for the initial non-activated water and MRET water activated for 30 min. The study was carried out with three samples of water derived from the identical distilled water:

- Initial distilled water;
- MRET activated water stored after the activation prior to the measurement for 30 min at room temperature;
- MRET activated water which was stored after the activation prior to the measurement for 5 hours at room temperature.

Such study allows us to determine the dependence of the influence of the activation on the IR-spectrum of water, as well as the influence of the storage duration of this water on its properties. It is seen from Fig. 2 that a decrease in the absorption of water (a decrease of the imaginary part of the dielectric permittivity) in the long wave part of the IR- occurs in the process of MRET activation. This decrease exceeds 10% for the range of wave numbers less than 300 cm^{-1} .

With increase of the wave number, the absolute value of a change in the coefficient of absorption remains approximately constant, and the relative change decreases, respectively. With increase of the duration of storage of activated water, the discovered change in the optical density in the IR-range gradually decreases.

The effect of a small decrease in the optical density of MRET activated water is also observed in the region of great wave numbers 1000–4000

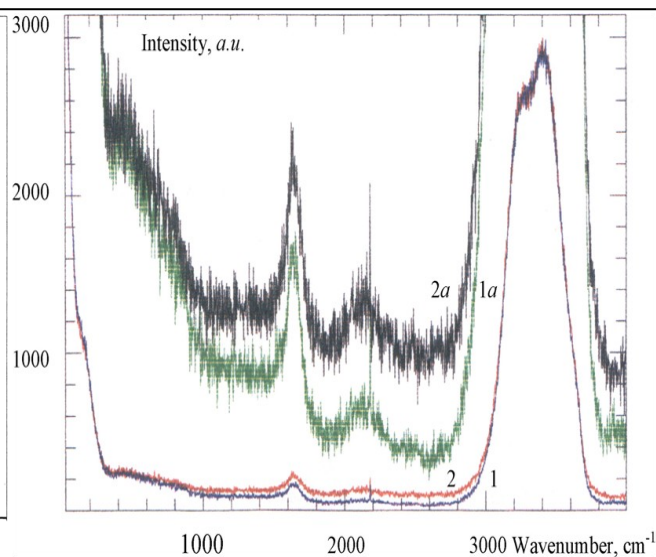


Fig. 4 Raman scattering spectra of non-activated (1) and activated (2) water. Fragments of the spectra (1a) and (2a) correspond to the increase in the scale by 10 times. All spectra were measured in 24 hours after the activation [Vysotskii et al., 2009].

cm^{-1} . This result is presented in Fig. 3 for non-activated water and water activated for 30 min (the spectrum of activated water was studied in 1 hour after the activation).

MRET activated water was also studied by Raman scattering spectroscopy. It is seen from the data presented in Fig. 4 that MRET activation of water, it leads to a small increase of the Raman scattering amplitude in the whole range from 1 cm^{-1} to 4000 cm^{-1} .

The optical characteristics of MRET activated water was additionally studied with the help of laser spectroscopy.

As a quantitative characteristic there was used the integral index of the molecular dynamics of water W which is inversely proportional to the coefficient of diffusion D of the scattering objects including the normalizing factor (in order to make W dimensionless).

The parameters of the scattered emission depend on the motion of scattering molecules of water and the ensembles of these molecules. Due to the presence of the fluctuation (diffusive) mechanical, motion of the scattering objects, the phase of the scattered emission continuously fluctuates, which decreases very sharply the coherence length of the scattered laser field. A change in the coherence length of the emission and the associated change in the spectrum of the emission are those parameters of which the measurement allows us to determine the

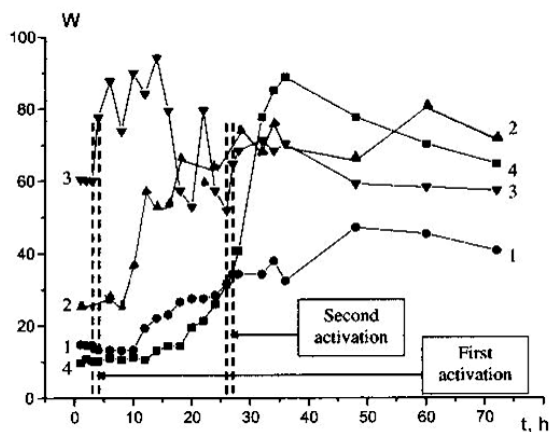


Fig. 5 Integral index W of the molecular dynamics of activated water of different types versus time. The numbers stand for the types of water mentioned above in the text [Vysotskii et al., 2009].

characteristics of the motion of scattering objects (the coefficient of diffusion) and, hence, the mass and size of these objects. The coherence length can be found with the help of the autocorrelation function (1.1).

It is seen (Fig.5) that the index W was changed comparatively slightly (except for water sample #3) for the time of the first activation process. Thereafter for 24 hours (with an interval of two hours) there was measured the index W for all types of water. It is seen that, for this time interval, there occurred a systematic increase of the index W for all types of water except for water #3. In this case, a change in W was accompanied by very strong oscillations for the water samples #2 and #3. At the same time, the index W for all the remaining types of water was changed as a monotonously increasing function of time. There was performed the second activation of water in 24 hours after the first activation with the same duration of one hour. The results of this activation also turned out ambiguous. After the activation, there was observed a very sharp increase of the index W for water sample #4. At the same time, this index was practically constant for the remaining samples of water. The measurements after the second activation were performed for 42 hours (At first, three measurements were carried out with an interval of two hours and then the other three measurements with an interval of 12 hours). After the completion of the whole cycle of measurements, the values of the index W for all samples of water (except for water sample #3) turned out to be exceeding the initial value W_0 (prior to the first

activation). The characteristics of water sample #3 after the completion of all actions and all measurements turned out to be equal to the initial values of the index W_0 which was determined prior to the beginning of the cycle of measurements [Vysotskii et al., 2009].

DISCUSSION:

The obtained experimental data provides evidence that the specific features of the spectrum of MRET activated water in IR, visible, and UV ranges preserve for a long time after the completion of the activation, though the very changes in the spectrum in these ranges turned out to be a small ones. Such changes in the optical properties of MRET activated water which are small in magnitude but with the long time of their preservation can be satisfactorily substantiated if we consider that they are related to a change in the properties of a relatively small number of separate molecules of water isolated from the external action and corresponding to the hindered relaxation. Based on the proposed model of the memory of water, we can refer such changes to the molecules of water being in the volume of clathrate microcavities [Vysotskii et al., 2005].

It was proposed earlier that there exists a strong repulsive electrostatic field in such microcavities. For this reason, the internal “walls” of microcavities possess the hydrophobic properties and do not form hydrogen bonds with molecules of water placed in the volume of microcavities. These molecules, due to the absence of a hydrogen bond with molecules of water forming the “walls” of microcavities, have a changed configuration of the electron shell (it corresponds to a free H_2O molecule, rather than that of a bound molecule) and, respectively, some different optical properties [Vysotskii et al., 2009].

The process of MRET activation renders a strong influence on the dynamics of the mechanical fluctuation motion of stable global structural elements in the water bulk. The formation and the long-term existence of such structural elements depend on the activation of water and confirm the possibility for the memory of water to exist. To find such structural formation in the body of MRET activated water there was used the laser spectroscopy method. The study of the correlation spectrum allows us to determine the mean characteristics of the motion of scattering objects in the water bulk and, on this basis, to perform the

qualitative analysis of the spatial structure of water. In addition, such studies allow one to determine the dependence of these characteristics on the activation of water.

In order to determine the regularities of the process of scattering, it is necessary to determine those quantities which are not random and describe unambiguously the scattering. The deterministic (nonrandom) characteristics of the scattered emission can be found if the autocorrelation function of field is known:

$$\begin{aligned}
 K_E(\vec{k}, \theta, R, \tau) &= \langle \{E(\vec{k}, \theta, R, t + \tau) - \langle E(\vec{k}, \theta, R, t + \tau) \rangle\} \{E^*(\vec{k}, \theta, R, t) - \langle E^*(\vec{k}, \theta, R, t) \rangle\} \rangle \\
 &= \left(\frac{NE_0^2}{R^2} \right) \langle |f(\vec{k}, \theta)|^2 \rangle |e^{-(i\omega_0 + k^2 D)\tau}|
 \end{aligned}
 \tag{1.1}$$

Where: E_0 is the amplitude of an incident wave;

$f(\vec{k}, \theta)$ is the scattering amplitude of the emission;

\vec{k} is the wave vector scattered by an angle θ ;

R is the distance from the region center in the water bulk, where the objects scattering the light are positioned;

N is a number of scattering objects in the volume of water;

E is the amplitude of the scattered electric field intensity;

D is the diffusion coefficient of scattering objects;

The spectrum of the scattered emission is calculated with the help of the Wiener–Khinchin formula:

$$\begin{aligned}
 S_E(\vec{k}, \theta, R, \omega) &= \frac{1}{2\pi} \int_{-\infty}^{\infty} K_E(\vec{k}, \theta, R, \tau) e^{-i\omega\tau} d\tau \\
 &= \langle |f(\vec{k}, \theta)|^2 \rangle \frac{NE_0^2}{\pi R^2} \frac{k^2 D}{(\omega - \omega_0)^2 + (k^2 D)^2}
 \end{aligned}
 \tag{1.2}$$

It is seen from formula (1.2) that the spectrum of the scattered emission depends on the coefficient of diffusion D defining the mean characteristics of the motion of scattering objects. This coefficient, in turn, depends on the size and mass of these objects.

An increase of the index W corresponds to a decrease of the coefficient of diffusion and characterizes uniquely the increase of the mass and

size of a stiffly bound molecular complex which is present in the water bulk and scatters the laser emission. There was performed the following procedure and the sequence of studies that total duration was equal to 71 hours. First of all there was carried out three measurements of the index W for 3 hours for each of the studied types of water. The purpose of these measurements were related to the determination of the stability of a measuring unit. The results of this “testing period” correspond to the first three points on all the plots presented in Fig. 5. The very small variance of the index W confirms a high degree of stability, a small value of the apparatus error, and the error related to the procedure of measurements. It is obvious that the differences of the indexes of molecular dynamics W for different types of water prior to the activation are related to a great extent to the differences of their salt composition. This is explained by the fact that the ions dissolved in water influence the mass and size of molecular complexes in water and, hence, the coefficient of diffusion of these complexes and the spectrum of the scattered laser emission. It is possible to assume that such an influence can be realized in at least two ways: on the one hand, the dissolved ions break the chemical homogeneity of water and therefore affect the formation of molecular complexes formed from molecules of water; on the other hand, the union of dissolved ions with these complexes changes the density and the mass of the latter. It is obvious that both mechanisms lead to the essential influence of dissolved salts on the spectrum of the scattered emission, which was observed in the study of various samples of water.

After the completion of the whole cycle of measurements, the values of the index W for all samples of water (except for water sample #3) turned out to be significantly exceeding the initial value W_0 (prior to the first activation) that allows to assume the formation of the water molecular super-clusters in the volume of water after MRET activation process.

The results of the optical study of MRET activated water in UV, IR spectrum, and Raman scattering spectra also provide evidence of the stable polarized-oriented multilayer molecular formation in activated water. It shows that the process of activation does not lead to a significant change of the electron subsystem of atoms and involves only structural and juxtaposition changes of the water molecular system. The confirmation of such molecular formations can explain the



phenomenon of anomalous viscosity and electrodynamic characteristics of MRET activated water [Smirnov 2007, 2008].

CONCLUSION:

There can be made the following conclusions based on the experimental results and analysis of measurements:

There was found both a very significant increase of the degree of correlation of the scattered emission and a decrease of the coefficient of diffusion of scattering complexes in water that testifies unambiguously the formation of very large and stable clusters in water after MRET activation. The results of the comparative optical study of MRET activated water and non-activated one in UV, IR spectrum, and Raman scattering spectra show that the process of MRET activation does not lead to a significant change of the electron subsystem of atoms and involves only structural changes of the water molecular system.

The processes of formation and change of these molecular clusters did not stop after the termination of the activation but continue for many hours and days. Such an effect can occur in the case where the activation of water induces the change of the properties of separate water molecules and strongly-bound molecular groups in a way that their further joining in great clusters becomes energy-gained. The process of formation of stable clusters in the volume of water depends significantly on the salt composition of water. In this case, different types of mineral water are characterized by different dependences of the parameter W on the time interval after the activation.

Such findings provide evidence that MRET activation may lead to the formation of polarized-oriented multilayer structuring of water molecules. The correlation analysis of the scattered laser emission also provides the unambiguous confirmation of the assumption about the presence of the stable water memory, the duration of existence of which can be equal to many hours and days. This memory can be interpreted as the existence of stable super-molecular clusters in the volume of water.

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