Red blood cells interaction with vanadium and its oxides based nanocomposite structures

V. PRILEPOV, P. GASIN, I. PRILEPOV, V. MIDONI[a,*], A. CHIRITA, D. SPOIALA, P. KETRUSH
Moldova State University, 60 A. Mateevici Str., Chisinau, MD-2009, Republic of Moldova
[a]National Institute of Materials Physics, 105 bis Atomistilor Str., P.O. Box MG 7, RO-77125 Măgurele, Romania

The results of the investigation of vanadium and its oxides based nanocomposite structures interaction with the water are brought in this paper. It was established, that at the non-contact interaction of the nanocomposite structures with the water, its activation occurs, which is revealed in a change in the sign of the redox potential of the water from the initial positive to the negative one. Besides, the activation effect is interconnected, i.e. the activation both of the water as well as of nanocomposite structures occurs. The observed effect is explained in the frame of the resonance interaction of the oscillating dipoles theory (the conductive clusters uniformly distributed in V_2O_5 dielectric matrix with the water molecule dipoles. On the basis of the experimental results, one can affirm that the vanadium and its oxides based nanocomposite structures are a biologic activators and can be used in a modern biomedicine.

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1. Introduction

In the last decades interest of scientists around the world is addressed to substance known under the name "water" and this interest is growing. The water physiological properties are influenced not only by its chemical composition and the degree of purification but also a whole series of complex parameters. In the paper [1] it was proposed to characterize the water as a complex structured system being in a state of thermodynamic equilibrium with its own characteristic radiation and its own micro-cluster structure.

One of the most important water parameters is its "charge" – redox potential (ROP), measured relative to chlorine-silver electrode. For the media transferred to the non-equilibrium state the ROP is an integral index [2], reflecting their structure and biological activity and it could be different even for the same pH value.

For all types of the drinking water its ROP is always higher than zero and usually is in the limits from +100 mV to +400 mV. At the same time it is known [3] that the ROP the most important index of the internal media of the human has a negative value (from -100mV to -200mV). The drinking water penetrating into the tissues of the human body influences cell membrane, nucleic acids, etc., subjecting them to oxidative degradation. So the body gets older, the vital organs are loosing their functions. Those negative processes could be significantly slowed, if to use the activated water with the negative ROP value [3].

Typically, the liquids electrochemical activation is carried out in the in the diaphragm or the non-diaphragm electrolysis unit [4].At this the liquids are in a direct contact with the surface of anode and cathode and go to the metastable state by changing its chemical composition, hydrogen ion concentration – pH, ROP, micro-cluster structure.

The physical fundamentals of the contactless activation of the liquids and aqueous solutions at electrolysis (fluid electro-activation without contact with the electrodes surface) were formulated by Gerlovin I.L. in [5] based on the theory of the fundamental field.

In the paper [6] the anomalous properties of the water activated by contactless method were studied. At the contactless electro-chemical activation the stable high energetic resonance systems of the oscillating dipoles appear close to the anode and cathode. In the static condition such dipole systems are unstable (the effect of the collapse), but in the dynamic at condition, at the resonance, the effect of the dynamic stabilization is manifested. The contactless activation could occur only through the thin walls at short distances of synchronously oscillating dipoles and it depends on diaphragm material properties.

B.I Kiselev method [7] of solutions contactless activation by magnetic field, by ultraviolet laser radiation with an additional exposure to the acoustical oscillations generator is also known, which changes the water micro-cluster structure from 20 dipoles to 2-3 ones. The methods itself is widely used for the treatment of many diseases and strengthen the immune system.

We have proposed a nanocomposite material based on vanadium pentoxide, which is uniformly distributed throughout the conductive clusters [8]. Two conducting

cluster inside the dielectric matrix are oscillating or have a resonance effect. If such films are placed in water, having a specific ROP, one can expect it to activate, with the sign of water ROP, without the use of additional external field action.

2. Samples fabrication

For to investigate the contactless activation of the water without the impact of the external field the nanocomposite structures were used obtained by the method given in [8]. For to increase the area of nanocomposite structure surface exposure two samples of the same set in a parallel connection were used. The two samples against each other by a not working sides of the pyroceramics substrates and were connected in parallel both by aluminum electrode as well as by V_2O_5 surface layer. The created battery of two plates was passivated by positive photoresist OP-383. The photoresist was deposited by extrusion from solution and by selecting of the extrusion rate the thickness of the resistive layer was established of the order of 1 μm. The photo-resistive layer was dried in the air at the temperature of 94-98 °C, and then at 138-140 °C during 15-20 min. For the activation of the water the aluminum vessel, covered with food varnish from the inside was used. The plates were placed at a distance of 2 cm from the bottom and were entirely covered by tap water. The functional behavior of water was estimated by a combined indicator of redox potential by using the portable ORP57 device. The electrodes of the parallel-connected nanocomposite structures were brought out by using wires in Teflon insulation which allowed the control of the activation process by I-U dependencies. In all events the studied water volume was 150 ml.

3. Experiment

Initially, it was established that negatively charged water, was located at the bottom of the vessel. Depending on the activation time the water negative potential increases. *I-U* dependencies, measured after 18 hrs, 42 hrs and 66 hrs in a semi-logarithmic scale (*lgI=f*(*U*)) are brought in Fig.1 (*a*), (*b*), and (*c*) correspondingly. If after 18 and 42 hours the nanocomposite charge sensitivity shows at *U*=119,5 mV. I.e. energetically larger clusters are formed, abruptly shifting the structure to the high level of current, then after 66 hours the shifting to higher level occurs at *U*= 139,0 mV. After 16 hours, the destruction of high-level is observed at *U*=98,5 mV, after 42 hours - at *U*=55,5 mV. After 66 hours, there is a transition portion of the upper energy level of destruction with *U*=17,45 mV to *U*=8,44 mV, followed by a sharp decline in the level of the initial current.

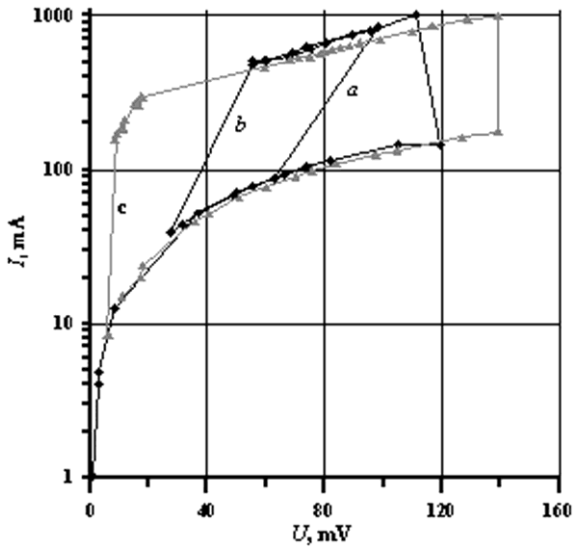


Fig.1. I-U dependences of a nanocomposite structure of two parallel connected samples, measured after: a – 18 hours, b – 42 hours and c – 66 hours.

The water ROP after 18, 42 and 66 hours and their relaxation time were measured. In all cases the initial water potential was positive and was in the limits of 380-420 mV. At ROP measurement the unit head was on the vessel bottom, the nanocomposite structures were not removed from the water. The ROP variation of the activated water (*E*, mV) in dependence on measurement time is given in Fig.2.

For low values of water activation duration (Fig.2, *a*) the relaxation comes in 15 minutes. For long durations of activation (Fig.2, *c*) the relaxation time increases to 45 minutes, wherein in the measurement time intervals of 5-40 minutes the ROP varies relatively smooth. The activated water relaxation dependence measured after 42 hours differs from the previous two (Fig.2, *b*).

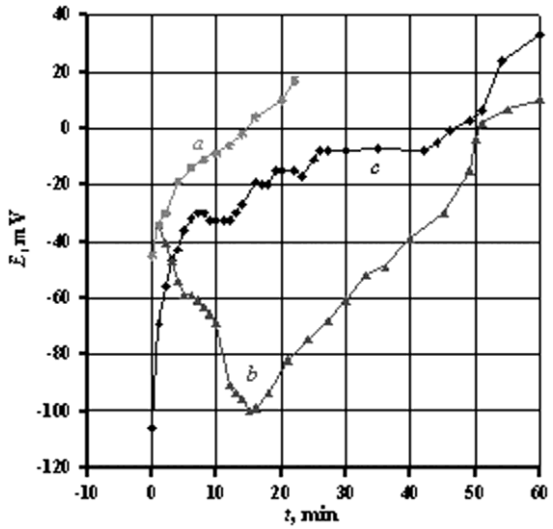


Fig. 2. The activated water ROP variation in time for the samples measured after: a – 18 hours, b – 42 hours and c – 66 hours.

The alternating electromagnetic field from the resonance system of the nanocomposite structure two clusters oscillating synchronously in opposite phase, have a narrow range of frequencies (resonance effect) and decreases rapidly [6]. That is the electromagnetic field which initially creates in the water synchronously oscillating dipoles, which causes the activation of the water. Over time, the secondary oscillating dipoles are formed, continuing to activate the water depth. When opening the container, an intense water oxidation (positive ROP), whose density is higher than for the negative activated water. This leads to an increase in negative ROP at the bottom can after 15 minutes of measurement (Fig.2, *b*). In this case the relaxation time of negatively charged water is 35 minutes.

4. Results and discussion

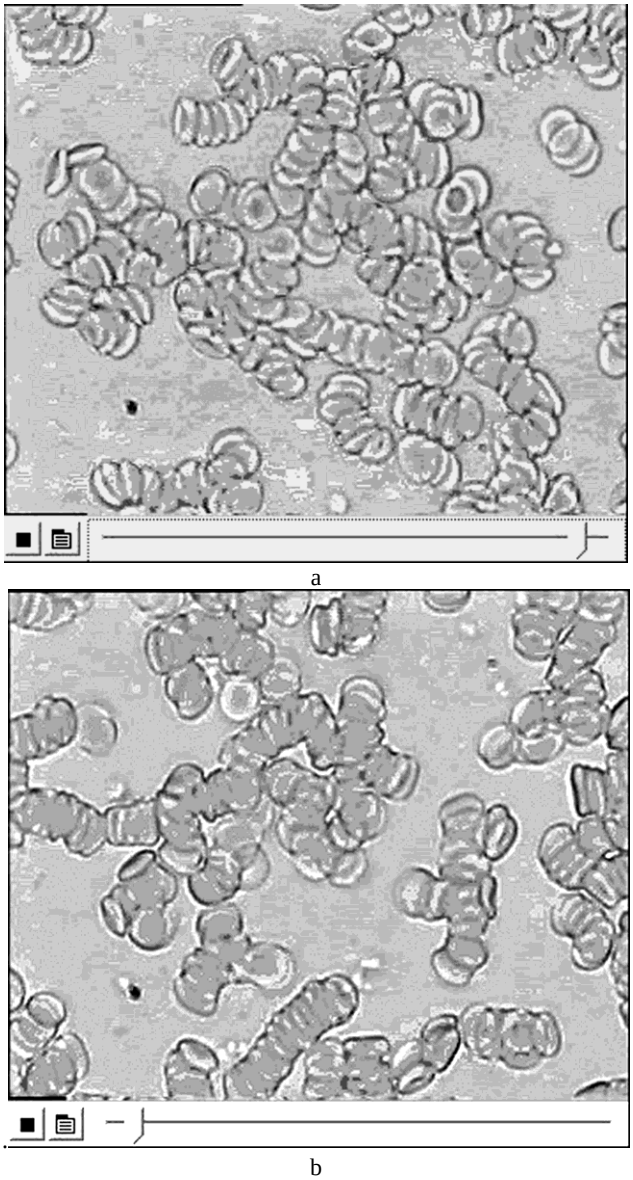
At vanadium and their oxides based nanocomposite layers interaction a contactless activation of the water occurs without any additional energetic impact. As a result of contactless activation the water ROP undergoes relaxation, which witnesses about the absence of stable electrolysis products penetration through the photoresist mask, i.e. the contactless activation occurs at an energetically level without accompanying mass transfer. The kind of contactless water activation without any additional energetic field impact is built-in the nanocomposite layer itself, possessing conductive clusters uniformly distributed in a dielectric matrix and high charge sensitivity.

The resonance interaction of the layers with the water witnesses about a real uniform distribution of the conductive clusters in V_2O_5 structures not only on a single plate but also on the others of the same batch.

One can clearly see from Fig.1 the effect of water structuring of nanocomposite layers themselves, which changes the charge sensitivity of the films, and the energy capacity of water can affect only the dead bindings in conducting clusters. Thus, the proposed nanocomposite structures based on dielectric V_2O_5 matrix, within which are uniformly distributed conductive clusters are simple and reliable activators.

This formula can be checked on the interaction of nano-composite structures with blood because the blood as well as the skin has their electric potential. The analysis was performed in a specialized laboratory. The picture of a blood drop taken from the finger for analysis was displayed on the TV screen. The analysis time was 3-5 minutes. During this time a plate with the nanocomposite structure was applied to the same finger and a repeated test was carried out,

The primary analysis shows slow-moving red blood cells stuck together (Fig.3, *a*).



a

b

Fig.3. Red blood cells image: a- primary analysis; b- secondary analysis, after the plate with the nanocomposite structure is applied.

The repeated blood tests showed an intense putting up bunches of red blood cells, the rate of which has increased by about an order of magnitude (Fig.3, *b*). If one applies a nanocomposite layer to the cheek with inflammation (SAW), then in 10-20 minutes the pain goes away, it remains only a bag is stretched skin, and the patient loses the desire to go to the doctor, although it is necessary to treat the tooth.

However, it should be noted that the application of the given nanocomposite structures in a medical practice needs additional studies about their interaction with blood as well as with other biological entities.

5. Conclusion

Nanocomposite layers based on V_2O_5 and conducting clusters are excellent activators of water and liquids.

At the nanocomposites interaction with water a mutual structuring of water by activating it, as well as of layer by changing its charge state.

The presence of uniformly distributed conducting clusters in a highly effective without imperfections dielectric matrix based on V_2O_5, allows the use of these films in human biomedicine, by layers structuring with a weak electromagnetic field of varying frequency.

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*Corresponding author: medapteh@mail.ru