Thematic Section: Theoretical Research. **Full Paper**
Subsection: Colloidal Chemistry. *Reference Object Identifier* – ROI: jbc-02/17-49-2-1
Publication is available for discussion in the framework of the on-line Internet conference "*Butlerov readings*".
http://butlerov.com/readings/
Submitted on February 23, 2017.

The "delay" effect. Effect of external magnetic activation on the behavior of oxyhydrate gels.

© **Yury I. Sukharev**,[1] **Inna Yu. Apalikova**,[2] and **Boris A. Markov**[3]
[1] *Federal State Budget Educational Institution of Higher Education "Chelyabinsk State University". Brothers Kashirinykh St., 129. Chelyabinsk, 454001. Ural Federal District, Chelyabinsk Region. E-mail: Yury_Sucharev@mail.ru.*
[2] *Chelyabinsk Higher Military Aviation Red Navy School of Navigators, a branch of the Military Educational and Scientific Center of the Air Force "The Air Force Academy named after Professor N.Ye. Zhukovsky and Yu.A. Gagarin "(Chelyabinsk). Gorodok-11, 1, branch of VUNTS VVS "VVA". 454015, Chelyabinsk,*
[3] *Federal State Autonomous Educational Institution of Higher Education "South Ural State University (National Research University)". pr., Lenin, 76. Chelyabinsk, 454080. Russia. E-mail: smpx1969@mail.ru.*

*Supervising author; +Corresponding author

Keywords: entangled states, emission-wave duality, quantum correlations, Lagrange mappings, Liesegang operator, multipoly, oxyhydrate gel systems, colloid clusters, spontaneous pulsation flow, diffuse double electric layer, topological continuum, dissociative-disproportional mechanism, Whitney theory, caustic geometry, Noise states.

Abstract

In this report we are trying to understand how internal stochasticity or internal toroidal noise in gel systems can be used to vary their properties, for example, sorption, and, consequently, acid-base catalytic ones. However, it is clear that any properties of oxyhydrate systems are fundamentally non-reproducible because of their stochastic uncertainty. But some trends in controlling the properties of oxyhydrates can, however, try to outline.

Let us proceed from the fact that in stuck in time or aged gels of oxyhydrates of d- and f-elements and, to a greater extent, in air-dry samples, more precisely in separate cells of these gel samples, the effect of stochastic synchronization, for example, of spatial vibrations of functional ion-exchange groups . We view these ionic groups as chaotic oscillators with close spectral properties. From the theory of chaos it is known that the oscillations of such partial systems can become completely identical. This phenomenon in the literature about the theory of chaos is called chaotic synchronization, complete or in-phase.

If the chaotic systems strongly differ in parameters, then complete synchronization is impossible. However, if the chaotic oscillators are relatively close, then when a sufficiently strong coupling occurs, an effect close to complete synchronization will be observed. This effect will be observed with a delay in time and is called lag-synchronization, that is, synchronization with delay.

Immediately after the action of the magnetic field on the gel samples, the changes in the sample are minimal. Then a redistribution of structured water in samples of yttrium oxyhydrate is observed. This leads to a change in the dehydration temperature and the amount of water that is split off at each stage. There are new stages of dehydration. The most pronounced differences between the derivatograms before and after the action of the magnetic field are detected after holding the sample treated by the field at room temperature for 7 days.

Macromolecules practically do not collapse, but they change their conformation. However, conformational changes may also be a consequence of the development of peptization-polymerization processes. The balance of bound water in yttrium oxyhydrate testifies to this.

The van der Waals elastic interaction forces tend to act in essentially the same initial directions, and after a while the polymer macromolecules are rearranged in the reverse direction, tending to the original state. In this case, even the rupture of bonds can occur, which is reflected in the imbalance of bound water (2 weeks after exposure). Again, the change in the structure of the oxyhydrate macromolecule is followed by a change in the DES. A month later, the molecule of yttrium oxyhydrate acquires a conformational structure close to the original one. This can be judged from the derivatograms of the yttrium oxyhydrate gel after 2, 3 and 4 weeks after exposure to the samples by a magnetic field.

References

[1] V.S. Anischenko, V.V. Astakhov, T.E. Vadivasova, A.B. Neiman, G.I. Strelkova, L. Shimansky-Geyer. Nonlinear effects in chaotic and stochastic systems. *Moscow, Izhevsk: Institute for Computer Research.* **2003**. P.529. (russian)

[2] V.A. Potyomkin, Yu.I. Sukharev. Formation of liotropic features of zirconium oxyhydrate gels. *J. Chemical Physics Letters.* **2003**. 371. P.626-633.

[3] Yu. Sucharev and V.A. Potyomkin. Formation of structuring elements of zirconium oxyhy-drate gels under unbalanced conditions. *Chemistry Preprint Archive.* **2002**. Vol.2002. Iss.4. P.108-128.

[4] Y.I. Sukharev, V.V. Avdin, A.A. Lymar, V.A. Potemkin. Formation of structural elements of oxyhydrate gels of zirconium and rare-earth elements in nonequilibrium conditions. *Journal of Physical Chemistry.* **2004**. Vol.78. No.7. P.1192-1197. (russian)

[5] Yu.I. Sukharev. Synthesis and application of specific oxyhydrate sorbents. *Moscow: Energoatomizdat.* **1987**. 120p. (russian)

[6] Yu.I. Sukharev. Effect of discontinuous and dilatant viscosity behavior in structured oxyhdrate gel systems. *Colloids and Surfaces A: Physicochemical and Engineering Aspects.* **2004**. Vol.249. Iss.1-3. P.135-139.

[7] I.Yu. Apalikova, Yu.I. Sukharev, A.G. Ryabukhin. Ion-exchange properties of sorbing polymers based on iron oxyhydrates, bi-chromate ions, applied. *Proceedings of the Chelyabinsk Scientific Center, Ural Branch of the Russian Academy of Sciences.* **2001**. No.2. P.68-72. (russian)

[8] Yu.I. Sukharev, E.P. Yudina, T.G. Krupnova. Kinetics of structuring in gels of yttrium oxyhydrate. *Proceedings of the Chelyabinsk Scientific Center, Ural Branch of the Russian Academy of Sciences.* **2004**. No.3. P.67-71. (russian)

[9] Yu.I. Sukharev, T.G. Krupnova, I.Yu. Apalikova, Yu.V. Berezhnaya, I.S. Lazarenko. Influence of the magnetic field on the sorption and rheological properties of oxyhydrate iron gels. *Izvestiya Chelyabinsk Scientific Center, Ural Branch of the Russian Academy of Sciences.* **2005**. No.2.

[10] A.M. Ilyin, B.A. Markov. Nonlinear diffusion equation and Liesegang rings. *Reports of the Russian Academy of Sciences.* **2011**. Vol.440. No.2. P.164-167. (russian)

[11] A.G. Sveshnikov, A.N. Bogolyubov, V.V. Kravtsov. Lectures on mathematical physics. *Publishing house of Moscow State University.* **1993**. 352p. (russian)

[12] S.M. Arakelyan, Yu.S. Chilingaryan. Nonlinear optics of liquid crystals. *Moscow: Nauka.* **1984**. 359p. (russian)

[13] Yu.I. Sukharev, B.A. Markov. Noise pulsations in oxyhydrate systems. *Publishing house of the CSU.* **2012**. 164p. (russian)

[14] J.L. Ericsen. *Arch. Ratio. Mech Anal.* **1960**. Vol.4. P.231.

[15] B.A. Markov, Yu.I. Sukharev, Yu.V. Matveychuk. Methodology of analysis of processes occurring in polymeric oxyhydrate gels. *Chim. Fiz. and Mesoscopy.* **2000**. Vol.2. No.1. P.38-51. (russian)