Thematic Section: Physical-Chemical Researches. **Full Paper**
Subsection: Colloidal Chemistry. *Registration Code of Publication:* 10-21-9-59
Publication is available for discussion in the framework of on-line conference "*Butlerov readings*".
http://butlerov.com/readings/
Contributed to editorial board: September 4, 2010.

Interrelation of thermogravimetric researches of zirconium oxyhydrates and spontaneous current pulsations of gel self-organization

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Keywords: *oxyhydrate gel, spontaneous pulsing current, diffuse double electrical layer, split polymerization, spike current, zirconium oxyhydrates, chain hydration, hydrated tetramers, noise of nonlinear system.*

Abstract

As the analysis of reconstructed attractors has shown, in the course of evolution the zirconium oxyhydrate gel undergoes a number of structural transformations causing the change of geometry and intensity of operating in oxyhydrate of ion-cluster streams. Besides, the character of their display often varies. It varies according to features of change SPC (spontaneous pulsing current or the current of self-organisation) in time (within two months of hydrogel life). By means of platinum or graphite electrodes it is possible to distinguish four time intervals of sample ages: the first (1-24 days), the second (25-40 days), the third (41-54 days), the fourth (55-60 days).

Rather high values current spikes can testify to the prevalence of certain secondary processes of the "split" polymerisation or hydrate cross-linking, elongations of gel macromolecules. Thus the amount of hydrate water in gel samples either decreases, or increases. It is established in our work by methods of thermogravimetry. Complicated structural transformations of polymeric chains of zirconium oxyhydrate start leaking in 35-40 days of gel ageing which is connected with the formation of the unstable complexes caused by removal of considerable quantities of water in 20-30 days.

With the elongation of chain its instability only increases, which sharply increases the probability of metastable condition relaxation that is the distraction of chains and removal of water. At certain critical length of a polymeric chain there should be its rupture. Two resultant fragments are more stable and can continue their growth again. At the rupture of polymeric chains, the structural water comes to the surface and participates in the formation of extended, diffuse double electric layers (DEL). So the pulsing character of water disintegration is quite clear. These reactions are found out at registration of ion-cluster spike currents in the electrochemical cell. Small values of currents define the evening-out processes of polymeric matrix destruction and its dehydration. Proceeding from these assumptions, most polymer - "disintegrated" samples formed by big current amplitudes on the module are considered to be gels of zirconium oxyhydrate, sustained in the growth solution within 25-40 days (2nd time interval). In this time area the greatest values of pulsing current (hundreds of nA) and the maximal mass losses are observed.