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Stochastic spontaneous burst of clusters in oxyhydrate colloidal system of iron(III) and dynamic viscosity change in time

© **Yuriy I. Sucharev**, **Evgenia V. Taramina**,
Alexander L. Kuznetsov, and **Irina Yu. Apalikova**[2]
Department of Solid Body Chemistry and Nanoprocesses. Chelyabinsk State University. Br. Kashirins St., 129. Chelyabinsk, 454000. Russia. *Phone: +7 (963) 460-27-75. E-mail: Yuri_Sucharev@mail*

*Supervising author; [+]Corresponding author

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Abstract

In the paper, it has been shown that biparticle interactions of clusters are not typical for colloidal cluster systems. In this case there is a third cluster (usually highly mobile), which "spreads" the energy in a certain way, making this structural organization energetically favorable. These nanoclusters are formed usually by the mechanism of dissociative-disproportionate destruction of gel macromolecules.

From the physicochemical point of view the singular points which are giving birth, among others, to nanoclusters on the gel folds of Whitney inhomogeneities, are in fact the active zones or points on the surface of the cluster, where there takes place the stochastic dissociative-disproportionate pushing of hydrated ionic formations to the dispersion medium or destruction of the double electric Gouy-Stern layers with the formation of complex patterns of features that is the singular points located at the normally located graphite plate. That is, the *contact structure* is formed.

Analysis of the contact structure or the web form enabled us to discover that, for samples aged for 30 days the gel is seen to be a system with a relatively quiet (homophase) structural continuum. Starting from the 30th day the structural organization of the hydrated iron oxyhydrate (HIO) changes dramatically and passes to the area of Whitney folds. This area covers the range of 30-41 per day. Thus the phase the orbits take the form of limiting cycles, sometimes with distinct Arnold tongues.

Oxo-olation polymerization of HIO, its depth can be traced in the study of the periodic change in the geometry of the phase portraits, the changes of dynamic viscosity of HIO. With the shear rate of 1.4 m / s in 1-40 days the geometry of the attractors has the form of convective rolls: in the range of 1-30 days we noted the region of the most pronounced changes in convection (13-30), followed by time intervals (30-41) (41-53, 53-62-71). Virtually identical intervals of aging areas are found on the phase portraits of the stochastic emission of charged oxyhydrate iron clusters. They are: 1-13 (15) days; 13-29 (31) (31-38 (41.45)) days, 38 ((41,45,48) -52), (52-66) days. We noted almost a complete correlation between the observed phase portraits of the stochastic emission of clusters with the phase portraits of the changing dynamic viscosity, built in the conditions of the convective flow of the gel during its oxo-olation polymerization.