

# Table of Contents

Preface

Table of Contents

## 1. Introduction

## 2. Genesis of Gel Oxyhydrate Systems of D- and F-Elements in the Course of their Formation Second Section's Title

2.1 Modelling of Autowave Processes in Forming Oxyhydrate Gels of Heavy Metals	3
2.2 Modelling of Active, Easily Excitable Gel Media	13
2.3 Research of Gels in Active, Easily Excitable Medium by Molecular Dynamics and Monte-Carlo Methods	21
2.4 Genesis of Oxyhydrate and Phosphate Gels (Experimentally Observed)	28
2.5 Conclusions	32

## 3. Periodic Phenomena of the Organization of Gel Oxyhydrate Systems

3.1 Analysis of Structurization Processes in Gel Systems	49
3.2 Quantization of Attractor (Pacemaker) Radii	63
3.3 Conclusions	79

## 4. Dilatancy Effect as A Specific Property of Periodicity of Gel Oxyhydrates

4.1 An Effect of Periodic Dilatancy in Oxyhydrate Gel Systems	85
4.2 Volumetric Dilatancy and Pacemaker Sizes	92
4.3 Conclusions	102
5. Liesegang Operator as a Reflection of Nonlinear properties of Oxyhydrate Gel Systems.	
5.1 Liesegang Rings as a Universal Gross-Property of gel polymer Systems.	103
5.2 Self-Coordination (Self-Assembly) of Gel Fragments	113
5.3 Physico-Chemical Interpretation of Liesegang Operator	120
5.4 Conclusions	124

## 6. Mesophase-Like Behaviour of Gel Systems

6.1 Formation of the Structured Elements of Zirconium Oxyhydrate Gels under Non-Equilibrium Conditions	127
6.2 Study of Polymeric Fragments of Niobium Oxyhydrate	137
6.3 Properties of the Liquid-Crystalline State of Gel Oxyhydrates that Develop with Time	156
6.4 Liquid-Crystal Features of Zirconium Oxyhydrate Gels. Model Studies	171

## 7. The Chromatic Effect of some Oxyhydrate Gels

7.1 Colouring of Oxyhydrate Gels of Heavy Metals	183
7.2 Study of Absorption Spectra of $[\text{ZrO}(\text{OH})_2]_n$ Polymer by Quantum Chemical Methods	193
7.4 Conclusions	197

## 8. Experimental Studies of Optical Properties of Gels. Observed Chromatic Effect . 8.1 Optical Properties of Zirconium Oxyhydrate

8.2 Structural Features and Optical Properties of Polymeric Gels of Yttrium Oxyhydrate	204
8.3 Structural Evolution of Oxyhydrates of Heavy Metals and Electromagnetic Radiation	209
8.4 Synthesis and Properties of the Coloured Gels of Zirconium Oxyhydrate	214

<b>8.5 Coloured Gels of Niobium Oxyhydrate</b>	220
<b>8.6 Effect of the Nature of Metal and Shear Strains on the Optical Spectra and Colouring of Oxyhydrate Gels</b>	223
<b>8.7 Synthesis of the Coloured Gels of Lanthanum and Yttrium Oxyhydrates</b>	235
<b>8.8 Conclusions</b>	240
 <b>9. The Phisico-Chemical Nature of Polarisation of Living Gels of Heavy Metals Oxyhydrates</b>	
<b>9.1 Introduction of Liesegang Operator, the Polarisation Operator</b>	243
<b>9.2 A Mechanism of Gel Polarization Conductivity. Rotational Motion of Polarization</b>	254
<b>9.3 Conclusions</b>	287
 <b>10. The Influence of Electric, Magnetic and Electromagnetic Fields on the Structurization Processes of Yttrium Oxyhydrate</b>	
<b>10.1 The Effect of the Static Magnetic and Electric Field on Gels</b>	321
<b>10.2 The Effect of Electromagnetic Radiation on Sorption Properties of Yttrium Oxyhydrate</b>	329
<b>10.3 The Effect of Electromagnetic Radiation on the Processes of Yttrium Oxyhydrate Formation</b>	334
<b>10.4 Conclusions</b>	340
<b>11. Nonlinear Sorption Properties of Oxyhydrate. 11.1 Experimental Studies of the Sorption System State “lanthanum Oxyhydrate – Own-Salt Solution” under Isothermal Conditions</b>	341
<b>11.2 Kinetics of the Process of Sorption-Peptization Self-Organization of Ytterbium and Gadolinium Oxyhydrate Gels</b>	347
<b>11.3 Kinetics of Sorption Processes in “zirconium Oxyhydrate - Yttrium Nitrate” Systems</b>	352
<b>11.4 Conclusion</b>	360
 <b>12. Quantum Chemical Study Of The Structural Models Of Zirconium Oxyhydrate</b>	
<b>12.1 Polymerisation of Zirconium Oxyhydrate Gels</b>	365
<b>12.2 Hydration of Zirconium Oxyhydrate Gels</b>	390
<b>12.3 Creation of Macromolecular Formations of Zirconium Oxyhydrate</b>	403
<b>12.4 Conclusion</b>	415

## **13. In Place of A Conclusion**

## **References**