

Content

PREFACE	9
INTRODUCTION.....	15
Chapter1. High-performance methods of diagnostics and identification of the abnormal neurological state parameters caused by cognitive feedback influences of the cerebral cortex	21
1.1 Problems of human neurological conditions.....	21
1.2 Comprehensive methodology and analysis tools for the diagnosis of neurological conditions of T-objects based on the hybrid ANM model. Problems of human neurological conditions	23
1.3 Hybrid mathematical model for the analysis of the ANM of the T-object based on feedback-connections and the effects of the neural nodes of the CC.....	26
1.4 Identification of AMM amplitude components. Inverse heterogeneous boundary value problem taking into account the cognitive feedback influences of the neuro-nodes of the CC	32
1.5 Initial-boundary value problems accompanying algorithms for identifying parameters in the ANM	35
1.6 Statement and methodology for the ANM conjugate boundary value problem solving	36
1.7 Statement and methodology for solving conjugate initial-boundary value problems of functional identification of the ANM	37
1.8 Expressions for gradient components and regularization expressions.....	39
1.9 Modeling and identification of parameters of complex multicomponent non-bio-feedback systems on multicore computers.....	42
Chapter 2. High-performance methods of modeling and identification of feedback influences of competitive adsorption of gaseous air pollutants at micro- and macro-levels in nanoporous systems.....	50

2.1. Analysis of research state	50
2.2 Experimental setup	52
2.3 Experimental results: Gaseous benzene and hexane competitive adsorption curves	52
2.4 A mathematical model of competitive adsorption and competitive diffusion in microporous solids	54
2.5 Numerical simulation and analysis: Competitive diffusion coefficients. Concentration profiles in inter- and intracrystallite spaces	62
2.6 Iterative gradient method of the identification of competitive diffusion coefficients	65
2.7 The linearization schema of the nonlinear competitive adsorption model. System of linearized problems and construction of solutions	69
Chapter 3. High computational methods and simulation technology nanoporous systems with feedback adsorption for gas purification	76
3.1 Nonlinear mathematical model of nonisothermal adsorption and desorption based on the generalized Langmuir adsorption equilibrium equation	77
3.2 The methodology for constructing analytical solution systems to heterogeneous adsorption / desorption problems	81
3.3 Computer simulation. Analysis of the distributions of the adsorbent concentration in the gas phase and nanopores of zeolite and temperatures	86
Chapter 4. High-performance algorithms for solving systems of nonlinear equations on supercomputers with parallel organization of computations.....	92
4.1 Layered parallel computing model.....	93
4.2 Parallel algorithms for solving SNE with a sparse data structure	97
4.3 Parallel algorithms for solving systems of linear equations with a sparse matrix	99

4.4 Hybrid algorithms for solving linear systems with sparse matrices of irregular structure based on LLT-decomposition of block-diagonal matrices with framing..	125
4.5 Experimental study of parallel algorithms	131
Chapter 5. The methods of integral transformations for creation of hybrid ANM-models.....	137
5.1. Finite integral Fourier transformation with spectral parameter for homogeneous media	137
5.2 Finite hybrid integral Fourier transformation for bounded heterogeneous n-component media	147
5.3 Integral Fourier transformation for semi-bounded heterogeneous n – component media	169
Conclusions	187
References	189