

Table of contents

List of conventional abbreviations 7

Introduction 9

CHAPTER 1

Basic technological methods for forming thin films of semiconductor materials for sensor structures 13

1.1. Methods of preparation of inorganic semiconductor thin films 14

1.1.1. Vacuum sputtering methods 15

1.1.1.1. Sputtering in open vacuum 15

1.1.1.2. Deposition of semiconductor films in a quasi-closed volume 18

1.1.1.3. Cathode sputtering 22

1.1.2. Chemical precipitation and mechanical application 23

1.1.2.1. Chemical vapor precipitation 23

1.1.2.2. Chemical precipitation from solution 24

1.1.2.3. Pulverization with subsequent pyrolysis 25

1.1.2.4. Electrodeposition and other chemical coating methods 26

1.1.3. Technological basis for producing thin films of multicomponent inorganic semiconductors under quasi-equilibrium conditions 27

1.2. Methods of preparation and properties of thin films of organic semiconductors 34

1.2.1. Physical properties of organic semiconductors 34

1.2.2. Influence of deposition conditions on the structure and optical properties of thin pentacene layers on solid surfaces 42

1.2.3. Technological basis for manufacturing thin films of organic semiconductors 45

1.3. Methods of preparation and properties of oxide layers 47

List of used references to Chapter 1 50

Methods of preparation, structure and properties of sensor films based on conjugated polymer systems 53

- 2.1. Electrochemical methods for forming polymer layers on optically transparent electrodes 55
- 2.2. Formation of composite sensor materials based on conductive polymers and dielectric polymer matrices 72
- 2.3. Production of polymer sensor films under the influence of physical factors 78
 - 2.3.1. Thermal vacuum deposition of conducting polymer layers 79
 - 2.3.2. High-frequency magnetron atomization 85
- 2.4. Formation of sensor films from solutions of conjugated polymer 88
 - 2.4.1. The process of the spin-coating method (rotation) 88
 - 2.4.2. Basics of the dip-coating method (immersion) 90
 - 2.4.3. Langmuir-Blodgett technology for production of nano-size sensor layers of conducting polymers 92
 - 2.4.4. Formation of self-assembling polymer films by layer-by-layer method 96
 - 2.4.5. Flexible elements of gas sensors and indicators 98
- 2.5. Organic-inorganic nanocomposites as sensitive elements of sensor structures 103
 - 2.5.1. Electrochemical preparation and properties of hybrid sensor structures based on porous silicon and conjugated polymers 104
 - 2.5.2. Synthesis and electrical properties of polyaniline composites with silicon (IV) oxide nanoparticles 110
 - 2.5.3. Hybrid nanosystems based on conjugated polymers doped with carbon nanoclusters 114

List of used references to Chapter 2 120

Conclusions 131