

CONTENTS

FOREWORD	ix
INTRODUCTION	xi
LIST OF RUSSIAN SPECIFICATIONS USED IN THIS BOOK	xiii

PART I CORROSION OF METALS

CHAPTER 1: <i>Classification of Corrosion Processes. Protective Films on Metals</i>	3
1. Classification of Corrosion Processes and Characteristics of Corrosion Velocity	3
2. Thickness of Protective Films	6
3. Properties of Protective Films	7
4. Growth of Protective Films	7
5. High Temperature Resisting Alloys	10
CHAPTER 2: <i>Chemical Corrosion</i>	12
6. Gaseous Corrosion of Iron and Steel	12
7. Corrosion of Non-ferrous Metals and Alloys at High Temperatures	16
8. Protection against Gaseous Corrosion	17
9. Corrosion in Non-electrolytic Liquids	18
CHAPTER 3: <i>Corrosion in Electrolytes</i>	20
10. Electrode Potentials of Metals	21
11. Role of the Galvanic Corrosion Couple	24
12. Polarization of a Galvanic Couple	28
13. Rate of Corrosion in Electrolytes	35
14. Multi-electrode Galvanic Cells	39
15. Influence of Internal Factors on the Rate of Corrosion	44
16. Influence of External Factors on the Rate of Corrosion	46
CHAPTER 4: <i>Corrosion Due to Mechanical Factors</i>	52
17. Stress Corrosion or Corrosion Cracking, Corrosion Fatigue and Corrosive Wear	52
CHAPTER 5: <i>Corrosion under Various Conditions</i>	55
18. Atmospheric Corrosion	55

19. Underground Corrosion	57
20. Stray Current Corrosion	57
CHAPTER 6: <i>Corrosion Resistance of Metals</i>	59
21. Iron	59
22. Nickel	67
23. Cobalt	69
24. Copper	69
25. Lead	74
26. Tin	76
27. Zinc	77
28. Cadmium	79
29. Aluminium	79
30. Magnesium	85
31. Noble and Other Metals	86
CHAPTER 7: <i>Corrosion Testing</i>	89
32. Corrosion Testing Methods	90
33. Methods of Expressing Corrosion Intensity	93

PART II

PROTECTION AGAINST CORROSION

CHAPTER 8: <i>Methods of Protecting Metals against Corrosion</i>	103
34. Treatment of the Surrounding Medium	103
35. Electrochemical Protection	106
36. Protective Coatings	108
CHAPTER 9: <i>Purpose and Methods of Metal Surface Preparation</i>	110
37. Mechanical Preparation	110
38. Chemical and Electrochemical Cleaning of Metal Surfaces	117
39. Application of Ultrasonic Oscillations to Surface Cleaning	130
40. Electrolytic and Chemical Polishing of Metals	135
CHAPTER 10: <i>Non-electrolytic Methods of Application of Metallic Coatings</i>	139
41. Hot Dipping	139
42. Metallic Diffusion Coatings (Cementation Processes)	145
43. Metallization (Metal Spraying)	154
44. Cladding (Production of Bimetal)	156

CONTENTS

vii

CHAPTER 11: <i>Electrolytic Deposition of Metals</i>	158
45. Introduction	158
46. Zinc Plating	167
47. Cadmium Plating	175
48. Tin Plating and Lead Plating	177
49. Copper Plating	182
50. Nickel Plating	187
51. Chromium Plating	191
52. Electrolytic Deposition of Noble Metals	196
53. Coatings Obtained by Contact Deposition (Galvanic Coatings)	199
54. Deposition of Alloys	200
CHAPTER 12: <i>Oxidation; Phosphating; Chemical and Electrochemical Dyeing of Metals</i>	206
55. Oxidation of Steel	207
56. Oxidation of Aluminium and its Alloys	209
57. Oxidation of Magnesium Alloys	213
58. Phosphating	215
59. Chemical and Electrochemical Dyeing of Non-ferrous Metal Articles	219
CHAPTER 13: <i>Control of Coating Quality</i>	221
60. Determination of the Coating Thickness	221
61. Determination of Porosity and Other Properties of Coatings	226
CHAPTER 14: <i>Basic Plating Shop Equipment for Electrolytic and Chemical Processing</i>	229
62. Stationary Vats	229
63. Equipment for Plating Small Articles	235
64. Semi-automatic and Automatic Plating Plant	242
65. Electrical Equipment	252
66. Ancillary Equipment	259
CHAPTER 15: <i>Automation of Plating Processes</i>	266
67. Reversing of Constant Current	266
68. Regulation of Current Density, pH and Temperature of the Electrolyte	269
69. Control of Coating Thickness during Electrodeposition	275
70. Regulation of the Electrolyte Level in the Bath	278
CHAPTER 16: <i>Enamelling and Coating of Metals with Organic Materials</i>	280
71. Enamelling	280
72. Paints and Lacquers	283

73. Phenol Aldehyde Resins and Other Materials	291
74. Rubberizing	292
CHAPTER 17: Protection <i>of</i> Metallic Articles in Storage, during Transport <i>and under Tropical Climate Conditions</i>	295
75. Rinsing and Greasing	295
76. Protection of Metals in Tropical Conditions	297
BIBLIOGRAPHY	301
ADDITIONAL BIBLIOGRAPHY FOR SUGGESTED FURTHER READING	306
AUTHOR INDEX	309
SUBJECT INDEX	311