

## CONTENTS

	Page
<b>Part One. GENERAL ASPECTS</b>	
Chapter One. WORKING PRINCIPLES OF CHEMICAL POWER SOURCES	
1.1 Basic concepts	3
1.2 Chemical reactions in cells	4
1.3 Open-circuit voltage, on –load voltage and current density	11
1.4 Faraday’s law : specific consumption of reactants	12
1.5 Thermodynamics of cell reactions	14
1.6 Analogues of chemical power sources	19
Chapter Two. CELL TYPES	
2.1 Electrochemical system of cells	22
2.2 Cell designs	29
Chapter Three. PERFORMANCE	
3.1 Electrical characteristics	38
3.2 Operational characteristics	46
3.3 Comparative characteristics	47
Chapter Four. ELECTROCHEMICAL ASPECTS OF CELL OPERATION	
4.1 Refined concept of electrode potential	52
4.2 Electrolytes : passage of current and transfer of ions and reactants	61
4.3 Polarization of the electrodes	68
4.4 Levelling-off elects. Distributed-parameter systems	72
4.5 Self-discharge	76
4.6 Electrocatalysis	79
Chapter Five. REAL ELECTRODES; POROUS SYSTEMS	
5.1 Properties of porous and disperse systems	84
5.2 Active mass	91
5.3 Secondary transformations in electrodes	95
5.4 Macrokinetics of processes in porous electrodes	97
Chapter Six. DESIGN AND TECHNOLOGY	
6.1 Main features of design	110
6.2 Ohmic losses	113
6.3 Separators	115
6.4 Operation of batteries	120
6.5 Sealing	124
6.6 Thermal processes in cells	132
6.7 Reserve batteries	136
Chapter Seven. OPERATIONAL PROBLEMS	
7.1 Discharge and maintenance of primary cells	139
7.2 Maintenance of storage cells	140
7.3 General aspects of battery maintenance	147
7.4 Charging devices	149
7.5 Transient processes	157
7.6 Reliability of cells and batteries	162
Chapter Eight. APPLICATIONS OF CELLS	
8.1 Present-day applications	165
8.2 Possible future fields of application	169

8.3 Economic problems	174
<b>Par Two. VARIOUS CELL SYSTEMS</b>	
Chapter Nine. MANGANESE-ZINC CELLS WITH SALT SOLUTION ELECTROLYTE	
9.1 General	181
9.2 Electrochemical and physicochemical processes	182
9.3 Types of the manganese-zinc cells	186
9.4 Performance	194
Chapter Ten. LEAD (ACID) STORAGE CELLS	
10.1 General	198
10.2 Electrochemical and physicochemical processes	199
10.3 Construction and manufacture	207
10.4 Performance	214
10.5 Maintenance of lead storage cells	219
10.6 Further development of lead storage cells	220
Chapter Eleven. NICKEL-CADMIUM AND NICKEL – IRON STORAGE CELLS	
11.1 General	224
11.2 Electrochemical and physicochemical processes	225
11.3 Construction and manufacture	228
11.4 Performance	235
11.5 Maintenance of alkaline storage cells	239
Chapter Twelve. ALKALINE CELLS WITH ZINC ANODES	
12.1 Zinc anode in alkaline electrolyte	242
12.2 Alkaline copper-zinc cells	247
12.3 Mercury-zinc cells	250
12.4 Alkaline manganese – zinc cells	254
12.5 Silver-zinc cells	260
12.6 Nickel-zinc storage cells	265
Chapter Thirteen. VARIOUS SYSTEMS WITH AQUEOUS SOLUTIONS	
13.1 Use of magnesium and aluminium in chemical power sources	269
13.2 Manganese – magnesium cells	272
13.3 Water –activated reserve cells with magnesium anodes	274
13.4 Chemical power sources with organic reactants	277
13.5 Various cells with PbO <sub>2</sub> electrodes	280
13.6 Standard cells	282
Chapter Fourteen. COMPOUND CELLS	
14.1 Air (oxygen) electrodes	285
14.2 Air-metal cells	290
14.3 Nickel-hydrogen storage cells	297
14.4 Chlorine-zinc storage cells	301
14.5 Lithium cells with aqueous electrolyte	304
Chapter Fifteen. CELLS WITH NON-AQUEOUS SOLUTIONS	
15.1 Lithium cells with electrolytes based on aprotic solvents	309
15.2 Ammonia-activated cells	317
Chapter Sixteen. CELLS WITH SOLID AND MOLTEN ELECTROLYTES	
16.1 Solid electrolytes in chemical power sources	320
16.2 Low-temperature miniature cells with solid electrolytes	323
16.3 Sulphur-sodium storage cells	324
16.4 Cells with molten electrolytes	330
16.5 Reserve-type thermal cells and batteries	333

Chapter Seventeen. FUEL CELLS (ELECTROCHEMICAL GENERATORS)	
17.1 General	338
17.2 Construction of fuel cells	341
17.3 Reactants for cells	343
17.4 Auxiliary systems	347
17.5 Oxygen (air) – hydrogen fuel cells with alkaline electrolyte	348
17.6 Oxygen-hydrogen cells with acidic electrolyte	357
17.7 Oxygen-hydrogen cells with ion-exchange membranes (solid polymer electrolyte)	358
17.8 Hydrazine fuel cells	359
17.9 Low-temperature fuel cells with organic fuels	362
17.10 High-temperature fuel cells	363
17.11 Prospects for application of fuel cells	366