

CONTENTS

<i>Preface</i>	vii
PART 1 FUNDAMENTALS OF ELECTROCHEMICAL METHODS AT SOLID ELECTRODES	1
1. Introduction	3
1-1. Historical Development of Voltammetry	3
1-2. Current-Voltage Curves	5
1-3. Electrode Systems	11
1-4. Polarization and Polarized Electrodes	13
1-5. Relation to Dropping Mercury Polarography	14
References	16
2. Scope and Limitations of Solid Electrodes	19
2-1. Background Processes and Potential Limits	19
2-2. Potential Ranges in Nonaqueous Media	29
2-3. Residual Currents	36
2-4. Cathodic Reactions	37
2-5. Anodic Oxidations	38
2-6. Sensitivity	38
2-7. Half-Wave Potentials	40
References	41
3. Mass Transfer to Stationary Electrodes in Quiet Solutions	43
3-1. Introduction	43
3-2. Linear Diffusion to Plane Electrodes	45
3-3. Cylindrical Diffusion	61
3-4. Diffusion to Spherical Electrodes	62
3-5. Convection in Unstirred Solution	63
References	64

4. Mass Transfer by Forced Convection	67
4-1. Nernst Diffusion Layer	67
4-2. Hydrodynamics and Forced-Convection Electrodes	71
4-3. Stationary Electrodes in Flowing Solution	76
4-4. Rotated Disk Electrodes	80
4-5. Applications of RDE to Electrode Kinetics and Mechanisms	92
4-6. Mass Transport with Turbulent Flow	102
4-7. Rotated Wire Electrodes	104
4-8. Vibrating Wire Electrodes	107
References	107
Special Bibliography on Rotated Disk Electrodes	110
5. Current-Potential Curves	115
5-1. Convective Mass Transport	115
5-2. Quiet Solutions	118
5-3. Rapid Voltage Sweep Methods at Stationary Electrodes	122
5-4. Single-Sweep Peak Voltammetry	124
5-5. Peak Polarograms of Systems with Coupled Chemical Reactions	139
5-6. Electron Transfer with Follow-up Chemical Reactions	140
5-7. Cyclic (Triangular Wave) Voltammetry	143
5-8. Conclusions	159
References	160
6. Electrochemical Methods Employing Controlled Current	163
6-1. Current Sweep Voltammetry	164
6-2. Chronopotentiometry	165
6-3. Chronopotentiometric Study of Electrode Processes: Methods Employing $i_0\tau^{1/2}$ Variation	172
6-4. Chronopotentiometric Study of Electrode Processes: Application of Current Programs	177
6-5. Practical Measurement of Transition Times	183
References	184
7. Electrode Surface Conditions	187
7-1. Introduction	187
7-2. Adsorbed Hydrogen Films on Platinum and Gold	189
7-3. Oxidation of Platinum and Gold Electrodes	191
7-4. Effect of Electrode History	205
7-5. Operating Procedures for Platinum Electrodes	206
References	208

CONTENTS	xiii
PART 2 EXPERIMENTAL AND APPLICATIONS	211
8. Investigation of Electrode Processes	213
8-1. Introduction	213
8-2. Evaluation of Diffusion Coefficients	214
8-3. Correlation of Electroanalytical Techniques: Electrode Reactions Without Chemical Complications	231
8-4. Determination of Heterogeneous Rate Constants	240
8-5. Electrode Processes with Coupled Homogeneous Chemical Reactions	244
8-6. Physicochemical Methods for Studying Electrode Reactions	255
References	262
9. Fabrication of Electrode Systems	267
9-1. Electrolytic Cells	267
9-2. Working Electrodes	270
9-3. Reference Half-Cells	288
9-4. Instrumentation	291
References	300
10. Applications to Organic Compounds	303
10-1. Basic Patterns for Anodic Oxidation of Aromatic Compounds	305
10-2. Aromatic Hydrocarbons	308
10-3. Primary Aromatic Amines	327
10-4. Secondary Aromatic Amines	345
10-5. Tertiary Aromatic Amines	351
10-6. Aromatic Diamines	356
10-7. Aromatic Hydroxy Compounds	363
10-8. Sulfur Compounds	369
10-9. Miscellaneous Aromatic and Heterocyclic Systems	370
10-10. Aliphatic Hydrocarbons	372
10-11. Aliphatic Acids	372
10-12. Aliphatic Alcohols and Aldehydes	375
10-13. Aliphatic Amines and Amides	375
10-14. Aliphatic Halides	377
10-15. Reduction Processes	377
References	378
<i>Author Index</i>	385
<i>Subject Index</i>	399