

CONTENTS

PREFACE, IX

1. BASIC PRINCIPLES, 1

- 1.1. INTRODUCTION: THE SURFACE SCIENCE APPROACH, 1
- 1.2. ENERGETICS OF CHEMISORPTION, 4
- 1.3. KINETICS OF CHEMISORPTION, 11
- 1.4. SURFACE DIFFUSION, 13

REFERENCES, 17

2. SURFACE STRUCTURE AND REACTIVITY, 21

- 2.1. INFLUENCE OF THE SURFACE STRUCTURE ON REACTIVITY, 21
- 2.2. GROWTH OF TWO-DIMENSIONAL PHASES, 24
- 2.3. ELECTROCHEMICAL MODIFICATION OF SURFACE STRUCTURE, 29
- 2.4. SURFACE RECONSTRUCTION AND TRANSFORMATION, 33
- 2.5. SUBSURFACE SPECIES AND COMPOUND FORMATION, 42
- 2.6. EPITAXY, 44

REFERENCES, 47

3. DYNAMICS OF MOLECULE/SURFACE INTERACTIONS, 51

- 3.1. INTRODUCTION, 51
- 3.2. SCATTERING AT SURFACES, 52
- 3.3. DISSOCIATIVE ADSORPTION, 54
- 3.4. COLLISION-INDUCED SURFACE REACTIONS, 59

3.5. "HOT" ADPARTICLES, 60
3.6. PARTICLES COMING OFF THE SURFACE, 64
3.7. ENERGY EXCHANGE BETWEEN ADSORBATE
AND SURFACE, 69
REFERENCES, 75

4. ELECTRONIC EXCITATIONS AND SURFACE CHEMISTRY, 79
4.1. INTRODUCTION, 79
4.2. EXOELECTRON EMISSION, 81
4.3. INTERNAL ELECTRON EXCITATION:
"CHEMICURRENTS", 86
4.4. ELECTRON-STIMULATED DESORPTION, 88
4.5. SURFACE PHOTOCHEMISTRY, 94
REFERENCES, 98

5. PRINCIPLES OF HETEROGENEOUS CATALYSIS, 103
5.1. INTRODUCTION, 103
5.2. ACTIVE SITES, 105
5.3. LANGMUIR-HINSHELWOOD VERSUS ELEY-RIDEAL
MECHANISM, 109
5.4. COADSORPTION, 111
5.5. KINETICS OF CATALYTIC REACTIONS, 113
5.6. SELECTIVITY, 117
REFERENCES, 120

6. MECHANISMS OF HETEROGENEOUS CATALYSIS, 123
6.1. SYNTHESIS OF AMMONIA ON IRON, 123
6.2. SYNTHESIS OF AMMONIA ON RUTHENIUM, 134
6.3. OXIDATION OF CARBON MONOXIDE, 139
6.4. OXIDATION OF HYDROGEN ON PLATINUM, 149
REFERENCES, 154

7. OSCILLATORY KINETICS AND NONLINEAR DYNAMICS, 159
7.1. INTRODUCTION, 159
7.2. OSCILLATORY KINETICS IN THE CATALYTIC CO
OXIDATION ON Pt(110), 163
7.3. FORCED OSCILLATIONS IN CO OXIDATION
ON Pt(110), 169
REFERENCES, 172

8. SPATIOTEMPORAL SELF-ORGANIZATION IN SURFACE REACTIONS, 175

- 8.1. INTRODUCTION, 175**
- 8.2. TURING PATTERNS AND ELECTROCHEMICAL SYSTEMS, 178**
- 8.3. ISOTHERMAL WAVE PATTERNS, 183**
- 8.4. MODIFICATION AND CONTROL OF SPATIOTEMPORAL PATTERNS, 189**
- 8.5. THERMOKINETIC EFFECTS, 195**
- 8.6. PATTERN FORMATION ON MICROSCOPIC SCALE, 198**

REFERENCES, 200

INDEX, 205