

# CONTENTS

Preface .....	xv
The International System of Units (SI) .....	xix

**CHAPTER 1: Structure and Orientation in Thin Films:  
Raman Studies with Integrated Optical  
Techniques  
J. F. Rabolt and J. D. Swalen**

1. Introduction .....	1
2. Theoretical Background .....	3
3. Experimental Aspects of Integrated Optics.....	11
4. Raman Considerations .....	15
5. Molecular Structure of Thin Films.....	17
6. Polymer Surfaces and Interfaces .....	23
7. Orientation of Molecules and Domains.....	30
8. Other Areas of Potential Application of Waveguide Raman Spectroscopy.....	33

**CHAPTER 2: The Selection Rules for Surface-enhanced  
Raman Spectroscopy  
J. A. Creighton**

1. Introduction .....	37
2. Summary of the Individual SERS Effects .....	38
3. The Electromagnetic Field Enhancement Selection Rule ..	52
4. Surface Resonance Raman Selection Rules.....	75
5. The Appearance of Raman-forbidden Bands: Surface Symmetry Perturbations and the Quadrupole Polarizability Raman Selection Rule.....	81
6. Selection Rules for Modulated Charge-transfer Mechanisms	83
7. Conclusions .....	85

**CHAPTER 3: The Application of Surface-Enhanced Raman Scattering to Biochemical Systems**

**T. M. Cotton**

1. Introduction .....	91
2. Applications of SERS to Biological Molecules .....	104
3. Applications of SERRS to Biological Molecules .....	121
4. Concluding Remarks.....	146

**CHAPTER 4: Static Secondary-Ion Mass Spectrometry for Surface Analysis**

**J. C. Vickerman**

1. Introduction .....	155
2. The SIMS Phenomenon .....	157
3. Instrumentation .....	170
4. The Application of Static SIMS in Surface Science .....	177
5. Materials Analysis by SSIMS .....	196
6. Prospects for Static SIMS .....	209

**CHAPTER 5: Inelastic Electron Tunnelling Spectroscopy in Chemistry**

**N. M. D. Brown**

1. Introduction .....	215
2. Theoretical Background .....	217
3. Experimental Considerations.....	232
4. Results and Applications .....	238

**CHAPTER 6: Electron-Excited Surface Spectroscopies**

**F. P. Netzer, J. A. D. Matthew and E. Bertel**

1. Introduction .....	283
2. The Interaction of Electrons with Matter .....	284
3. Experimental Considerations.....	291
4. Auger Electron Spectroscopy .....	296
5. Electron Energy-Loss Spectroscopy .....	316
6. Electron-Beam Damage .....	347
7. Electron-Stimulated Ion Desorption.....	350
8. Inverse Photoemission Spectroscopy .....	361
9. Epilogue .....	367

**CHAPTER 7: Electron Energy-Loss Spectroscopy****M. A. Chesters and N. Sheppard**

1. Introduction—the Scope of EELS.....	377
2. Electron Energy-Loss Spectrometers .....	380
3. Scattering Mechanisms and Selection Rules .....	385
4. Application of EELS to Adsorbed Species.....	392
5. Application of EELS to the Study of Crystal Vibrations .	400
6. EELS vs. Infrared Reflection–Absorption Spectroscopy ..	406
7. Conclusions .....	410

**CHAPTER 8: Infrared Reflection–Absorption Spectroscopy of Adsorbed Molecules****A. M. Bradshaw and E. Schweizer**

1. Introduction .....	413
2. Theoretical Considerations.....	419
3. Experimental Considerations .....	433
4. Some Selected Adsorption Systems .....	447
5. Summary and Outlook .....	476

Subject Index.....	485
--------------------	-----