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Nota di contenuto	Dynamics at Solid State Surfaces and Interfaces; Contents; Preface; List of Contributors; Colour Plates; 1 The Electronic Structure of Solids; 1.1 Single-Electron Approximation; 1.1.1 The Drude Model of the Free Electron Gas; 1.1.2 The Electronic Band Structure: Metals, Insulators, and Semiconductors; 1.2 From Bloch Theory to Band Structure Calculations; 1.2.1 Bloch Theory; 1.2.2 The Tight Binding Approach to the Solid; 1.2.3 Band Structure Calculations; 1.3 Beyond the Band Picture; 1.3.1 Mott's Hydrogen Solid; 1.3.2 Mott Insulators in Nature; 1.4 Electronic Structure of Correlated Materials 1.4.1 The Hubbard Model1.4.2 Dynamical Mean Field Theory; 1.4.3

Electronic Structure Calculations; 1.4.4 Ordered States; 1.4.5 Cooperation Between Lattice Instabilities and Electronic Correlations: The Example of Vanadium Dioxide; References; 2 Quasi-Particles and Collective Excitations; 2.1 Introduction; 2.2 Quasi-Particles; 2.2.1 Electrons and Holes; 2.2.2 Phonons; 2.2.2.1 Adiabatic Approximation; 2.2.2.2 Harmonic Approximation; 2.2.2.3 Lattice Dynamics; 2.2.2.4 Phonons at Surfaces; 2.2.3 Electron-Phonon Coupling in Metals; 2.2.4 Excitons: Electron-Hole Pairs in Semiconductor Quantum Wells 2.2.4.1 Microscopic Theory 2.2.4.2 Excitonic Resonances and Populations; 2.2.4.3 Terahertz Spectroscopy of Exciton Populations; 2.2.4.4 Excitonic Signatures in the Photoluminescence; 2.2.5 Polarons: Electron-Phonon Coupling in Polar and Ionic Solids; 2.3 Collective Excitations; 2.3.1 Plasmons: Electron Density Oscillations; 2.3.1.1 Surface Plasmons; 2.3.1.2 Acoustic Surface Plasmons; 2.3.2 Magnons: Elementary Excitations in Ferromagnetic Materials; 2.3.2.1 Spin Waves in the Heisenberg Model; 2.3.2.2 Itinerant Electrons; 2.3.2.3 Conclusions

2.4 Experimental Access to Quasi-Particle and Collective Excitations 2.4.1 Coherent Phonons; 2.4.1.1 Coherent Optical Phonons; 2.4.1.2 Coherent Acoustic Phonons; 2.4.2 High-Resolution Angle-Resolved Photoemission; 2.4.2.1 Photoemission Spectral Function of Quasi-Particles; 2.4.2.2 Experimental Considerations for Photoelectron Spectroscopy; 2.4.2.3 Quasi-Particles from Electron-Phonon Interaction; 2.4.2.4 Quasi-Particles from Electron-Magnon Interaction; 2.4.2.5 Conclusions and Implications; 2.4.3 Time-Resolved Photoelectron Spectroscopy; 2.4.3.1 Experiment; 2.4.3.2 Electron Lifetimes 2.4.3.3 Electron-Phonon Coupling 2.4.3.4 Surface Exciton Formation; 2.4.3.5 Magnon Emission; 2.4.3.6 Magnon-Phonon Interaction; 2.5 Summary; References; 3 Surface States and Adsorbate-Induced Electronic Structure; 3.1 Intrinsic Surface States; 3.1.1 Basic Concepts of Surface States; 3.1.2 Scattering Model of Surface States; 3.2 Crystal-Induced Surface States; 3.2.1 Tamm and Shockley Surface States; 3.2.2 Dangling Bond States; 3.3 Barrier-Induced Surface States; 3.3.1 Image Potential States; 3.3.2 Quantum Well States; 3.4 Experimental Methods; 3.4.1 Photoemission; 3.4.2 Two-Photon Photoemission 3.4.3 Scanning Tunneling Methods

## Sommario/riassunto

This two-volume work covers ultrafast structural and electronic dynamics of elementary processes at solid surfaces and interfaces, presenting the current status of photoinduced processes. Providing valuable introductory information for newcomers to this booming field of research, it investigates concepts and experiments, femtosecond and attosecond time-resolved methods, as well as frequency domain techniques. The whole is rounded off by a look at future developments.