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Nota di contenuto	Infochemistry: Information Processing at the Nanoscale; Contents; Preface; Acknowledgements; 1 Introduction to the Theory of Information; 1.1 Introduction; 1.2 Definition and Properties of Information; 1.3 Principles of Boolean Algebra; 1.4 Digital Information Processing and Logic Gates; 1.4.1 Simple Logic Gates; 1.4.2 Concatenated Logic Circuits; 1.4.3 Sequential Logic Circuits; 1.5 Ternary and Higher Logic Calculi; 1.6 Irreversible vs Reversible Logic; 1.7 Quantum Logic; References; 2 Physical and Technological Limits of Classical Electronics; 2.1 Introduction 2.2 Fundamental Limitations of Information Processing 2.3 Technological Limits of Miniaturization; References; 3 Changing the Paradigm: Towards Computation with Molecules; References; 4 Low-

Dimensional Metals and Semiconductors; 4.1 Dimensionality and Morphology of Nanostructures; 4.2 Electrical and Optical Properties of Nanoobjects and Nanostructures; 4.2.1 Metals; 4.2.2 Semiconductors; 4.3 Molecular Scale Engineering of Semiconducting Surfaces; 4.3.1 Semiconductor-Molecule Interactions; 4.3.2 Electronic Coupling between Semiconducting Surfaces and Adsorbates; References

5 Carbon Nanostructures 5.1 Nanoforms of Carbon; 5.2 Electronic Structure and Properties of Graphene; 5.3 Carbon Nanotubes; 5.4 Conjugated and Polyaromatic Systems; 5.5 Nanocarbon and Organic Semiconductor Devices; References; 6 Photoelectrochemical Photocurrent Switching and Related Phenomena; 6.1 Photocurrent Generation and Switching in Neat Semiconductors; 6.2 Photocurrent Switching in MIM Organic Devices; 6.3 Photocurrent Switching in Semiconducting Composites; 6.4 Photocurrent Switching in Surface-Modified Semiconductors; References

7 Self-Organization and Self-Assembly in Supramolecular Systems 7.1 Supramolecular Assembly: Towards Molecular Devices; 7.2 Self-Assembled Semiconducting Structures; 7.3 Self-Assembly at Solid Interfaces; 7.4 Controlling Self-Assembly of Nanoparticles; 7.5 Self-Assembly and Molecular Electronics; References; 8 Molecular-Scale Electronics; 8.1 Electron Transfer and Molecular Junctions; 8.2 Nanoscale Electromagnetism; 8.3 Molecular Rectifiers; References; 9 Molecular Logic Gates; 9.1 Introduction; 9.2 Chemically Driven Logic Gates; 9.2.1 OR Gates; 9.2.2 AND Gates; 9.2.3 XOR Gates; 9.2.4 INH Gates; 9.2.5 IMP Gates; 9.2.6 Inverted Logic Gates (NOR, NAND, XNOR); 9.2.7 Beyond Classical Boolean Scheme-Ternary Logic and Feynman Gate; 9.3 All-Optical Logic Gates; 9.4 Electrochemical Logic Systems; References; 10 Molecular Computing Systems; 10.1 Introduction; 10.2 Reconfigurable and Superimposed Molecular Logic Devices; 10.3 Concatenated Chemical Logic Systems; 10.4 Molecular-Scale Digital Communication; 10.4.1 Multiplexers and Demultiplexers; 10.4.2 Encoders and Decoders; 10.4.3 Molecular-Scale Signal Amplification; 10.5 Molecular Arithmetics: Adders and Subtractors 10.5.1 Molecular-Scale Half-Adders

Sommario/riassunto

"Infochemistry: Information Processing at the Nanoscale, defines a new field of science, and describes the processes, systems and devices at the interface between chemistry and information sciences. The book is devoted to the application of molecular species and nanostructures to advanced information processing. It includes the design and synthesis of suitable materials and nanostructures, their characterization, and finally applications of molecular species and nanostructures for information storage and processing purposes. Divided into twelve chapters; the first three chapters serve as an introduction to the basic concepts of digital information processing, its development, limitations and finally introduces some alternative concepts for prospective technologies. Chapters four and five discuss traditional low-dimensional metals and semiconductors and carbon nanostructures respectively, while further chapters discuss Photoelectrochemical photocurrent switching and related phenomena and self-organization and self-assembly. Chapters eight, nine and ten discuss information processing at the molecular level, and eleven describes information processing in natural systems. The book concludes with a discussion of the future prospects for the field. Further topics: Traditional electronic device development is rapidly approaching a limit, so molecular scale information processing is critical in order to meet increasing demand for high computational power Characterizes chemical systems not according to their chemical nature, but according to their role as prospective information technology elements Covers the application of

molecular species and nanostructures as molecular scale logic gates, switches, memories, and complex computing devices. This book will be of particular interest to researchers in nanoelectronics, organic electronics, optoelectronics, chemistry and materials science. "--

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