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Nota di contenuto	Activation of Small Molecules; Contents; Preface; List of Contributors; 1 Carbon Dioxide Reduction and Uses as a Chemical Feedstock; 1.1 Introduction; 1.2 Properties of the CO(2) Molecule; 1.2.1 Molecular Geometry; 1.2.2 Spectroscopic Properties; 1.2.2.1 Vibrational; 1.2.2.2 UV-Vis; 1.2.2.3 (13)C-Nuclear Magnetic Resonance (NMR); 1.2.3 Energy Data and Reaction Kinetics Relevant to CO(2) Conversion; 1.3 CO(2) Coordination to Metal Centers and Reactivity of Coordinated CO(2); 1.3.1 Modes of Coordination; 1.3.2 Interaction of CO(2) with Metal Atoms at Low Temperature: Stability of the Adducts 1.3.3 Reactivity of CO(2) Coordinated to Transition Metal Systems1.4 CO(2) Conversion; 1.4.1 Carboxylation Reactions; 1.4.1.1 C-C Bond Formation; 1.4.1.1.1 Natural Processes; 1.4.1.1.2 Artificial Processes; 1.4.1.2 N-C Bond Formation; 1.4.1.3 O-C Bond Formation; 1.4.1.3.1 Cyclic Carbonates; 1.4.1.3.2 Linear Carbonates; 1.4.1.4 Use of Urea as an Active-CO(2) Form; 1.4.1.5 Transesterification Reactions; 1.4.2 Reduction Reactions; 1.4.2.1 Energetics of the Reactions; 1.4.2.1.1

Natural Processes; 1.4.2.1.2 Artificial Processes; 1.4.2.1.3 Photoelectrochemical Reduction; 1.5 Conclusions; References

2 Nitrogen Monoxide and Nitrous Oxide Binding and Reduction

2.1 Introduction; 2.2 NO; 2.2.1 Bonding and Structures of Metal Nitrosyls; 2.2.1.1 Heme Proteins: Guanylate Cyclase - NO Binding and Trans-bond Labilization; 2.2.1.2 Bridging ((1)-(2)-) Complexes; 2.2.1.3 (1)-(3)-NO Bridging Complexes; 2.2.1.4 (2)-NO Bridging Complexes; 2.2.1.5 Isonitrosyl and Side-on (2)-NO Complexes; 2.2.1.6 Side-on (2)-NO Copper Protein Structures; 2.2.1.7 Spectroscopic Features of Nitrosyl Metal Complexes; 2.2.2 Chemical Reduction of NO and Related Chemistry; 2.2.2.1 Chemical Reduction of Metal-bound NO

2.2.2.1.1 Metal-NO Reduction Accompanied by N-O Cleavage

2.2.2.2 Electrophilic Attack on Metal-bound NO:HNO (Nitroxyl) Complexes; 2.2.2.3 Electrocatalytic Reduction of NO; 2.2.2.4 Biological NO Reduction: NORs; 2.2.2.4.1 Bacterial NORs of the Heme Copper Oxidase (HCO) Type [54, 147]; 2.2.2.4.2 Models for NORs; 2.2.2.4.3 Fungal P450-type NORs; 2.2.2.4.4 Flavorubredoxins as Scavenging (S)-NORs; 2.2.2.5 Metal Complex-mediated NO Disproportionation; 2.3 N(2)O; 2.3.1 Structure and Bonding; 2.3.2 Metal-mediated N(2)O Reduction; 2.3.2.1 Oxo Transfer Reactions; 2.3.2.2 Catalytic Oxo Transfer

2.3.2.3 N(2)O N-N Bond Cleavage

2.3.2.4 Electrocatalytic Reduction of N(2)O to N(2); 2.3.2.5 Biological N(2)O Reduction; 2.4 Summary and Conclusions; References; 3 Bio-organometallic Approaches to Nitrogen Fixation Chemistry; 3.1 Introduction - The N(2) Fixation Challenge; 3.2 Biological N(2) Reduction; 3.2.1 General Comments; 3.2.2 Structural Data; 3.2.3 Assigning the FeMoco Oxidation States; 3.3 Biomimetic Systems that Model Structure and Function; 3.3.1 General Comments; 3.3.2 Mononuclear Molybdenum Systems of Biomimetic Interest; 3.3.2.1 The Originally Proposed "Chatt Cycle"

3.3.2.2 An Electrocatalytic Reduction Cycle using Low-valent Tungsten

Sommario/riassunto

The first to combine both the bioinorganic and the organometallic view, this handbook provides all the necessary knowledge in one convenient volume. Alongside a look at CO₂ and N₂ reduction, the authors discuss O₂, NO and N₂O binding and reduction, activation of H₂ and the oxidation catalysis of O₂. Edited by the highly renowned William Tolman, who has won several awards for his research in the field.