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Nota di bibliografia

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Nota di contenuto

A CHEMIST'S GUIDE TO VALENCE BOND THEORY; CONTENTS; PREFACE; 1 A Brief Story of Valence Bond Theory, Its Rivalry with Molecular Orbital Theory, Its Demise, and Resurgence; 1.1 Roots of VB Theory; 1.2 Origins of MO Theory and the Roots of VB-MO Rivalry; 1.3 One Theory is Up the Other is Down; 1.4 Mythical Failures of VB Theory: More Ground is Gained by MO Theory; 1.5 Are the Failures of VB Theory Real?; 1.5.1 The O(2) Failure; 1.5.2 The C(4)H(4) Failure; 1.5.3 The C(5)H(5)(+) Failure; 1.5.4 The Failure Associated with the Photoelectron Spectroscopy of CH(4) 1.6 Valence Bond is a Legitimate Theory Alongside Molecular Orbital Theory1.7 Modern VB Theory: Valence Bond Theory is Coming of Age; 2 A Brief Tour Through Some Valence Bond Outputs and Terminology; 2.1 Valence Bond Output for the H(2) Molecule; 2.2 Valence Bond Mixing Diagrams; 2.3 Valence Bond Output for the HF Molecule; 3 Basic Valence Bond Theory; 3.1 Writing and Representing Valence Bond Wave Functions; 3.1.1 VB Wave Functions with Localized Atomic Orbitals; 3.1.2 Valence Bond Wave Functions with Semilocalized AOs; 3.1.3 Valence Bond Wave Functions with Fragment Orbitals 3.1.4 Writing Valence Bond Wave Functions Beyond the 2e/2c Case3.1.5 Pictorial Representation of Valence Bond Wave Functions by Bond Diagrams; 3.2 Overlaps between Determinants; 3.3 Valence Bond Formalism Using the Exact Hamiltonian; 3.3.1 Purely Covalent Singlet and Triplet Repulsive States; 3.3.2 Configuration Interaction Involving Ionic Terms; 3.4 Valence Bond Formalism Using an Effective Hamiltonian; 3.5 Some Simple Formulas for Elementary Interactions; 3.5.1 The Two-Electron Bond; 3.5.2 Repulsive Interactions in Valence Bond Theory; 3.5.3 Mixing of Degenerate Valence Bond Structures 3.5.4 Nonbonding Interactions in Valence Bond Theory3.6 Structural Coefficients and Weights of Valence Bond Wave Functions; 3.7 Bridges between Molecular Orbital and Valence Bond Theories; 3.7.1 Comparison of Qualitative Valence Bond and Molecular Orbital Theories; 3.7.2 The Relationship between Molecular Orbital and Valence Bond Wave Functions; 3.7.3 Localized Bond Orbitals: A Pictorial Bridge between Molecular Orbital and Valence Bond Wave Functions; Appendix; 3.A.1 Normalization Constants, Energies, Overlaps, and Matrix Elements of Valence Bond Wave Functions 3.A.1.1 Energy and Self-Overlap of an Atomic Orbital-Based Determinant3.A.1.2 Hamiltonian Matrix Elements and Overlaps between Atomic Orbital-Based Determinants; 3.A.2 Simple Guidelines for Valence Bond Mixing; Exercises; Answers; 4 Mapping Molecular Orbital-Configuration Interaction to Valence Bond Wave Functions; 4.1 Generating a Set of Valence Bond Structures; 4.2 Mapping a Molecular Orbital-Configuration Interaction Wave Function into a Valence Bond Wave Function; 4.2.1 Expansion of Molecular Orbital Determinants in Terms of Atomic Orbital Determinants 4.2.2 Projecting the Molecular Orbital-Configuration Interaction Wave Function Onto the Rumer Basis of Valence Bond Structures

Sommario/riassunto

This reference on current VB theory and applications presents a practical system that can be applied to a variety of chemical problems in a uniform manner. After explaining basic VB theory, it discusses VB applications to bonding problems, aromaticity and antiaromaticity, the dioxygen molecule, polyradicals, excited states, organic reactions, inorganic/organometallic reactions, photochemical reactions, and catalytic reactions. With a guide for performing VB calculations, exercises and answers, and numerous solved problems, this is the premier reference for practitioners and upper-level student

