Unlocking New Potential: Schiff Bases as Versatile Scaffolds in Metalorganic Synthesis of Zinc(II) Complexes

Background and State of the Art:

Over the past decade, the field of metalorganic chemistry has witnessed a paradigm shift, moving from the simple observation of coordination compounds to the deliberate design of functional molecular architectures. In this context, Schiff base ligands have proven to be far more than mere chelating agents; they represent highly tunable scaffolds capable of stabilizing a vast library of metal centers. Among these, Zinc(II) stands out as a unique metal node. Its closed-shell d^{10} electronic configuration provides a silent yet robust platform for structural engineering, devoid of the complicating redox activity or Jahn-Teller distortions found in other transition metals. This long-term investigation traces the evolution of Schiff base design—from simple mono or bidentate systems to complex multidentate and macrocyclic frameworks—demonstrating how the synergy between ligand flexibility and the coordination requirements of Zinc(II) can be exploited to create stable, predictable, and highly functional metalorganic systems.

Objective and Scope of the Talk:

This presentation provides a comprehensive overview of several years of systematic research dedicated to the synthesis and strategic application of Zinc(II) Schiff base complexes.[1] The primary objective is to illustrate how "unlocking" the chemical potential of these systems requires a holistic approach that bridges fundamental coordination chemistry with advanced material science. Intriguingly, our longitudinal analysis of various structural families reveals an intriguing trend: the functional properties of these Zinc(II) systems do not merely exist, but are explicitly dictated by the specific nature and positioning of the substituents anchored to the Schiff base scaffold. This talk will explore the relationship between molecular symmetry, electronic effects of the substituents, and the resulting macroscopic properties. Rather than focusing on a single study, the scope is to demonstrate the extraordinary versatility of the Zinc-Schiff base moiety as a "molecular toolkit" capable of addressing diverse challenges, including the development of selective chemical sensors and the assembly of supramolecular architectures.

1. Giuseppe Consiglio, Ivan Pietro Oliveri, Salvatore Failla and Santo Di Bella; On the Aggregation and Sensing Properties of Zinc(II) Schiff-Base Complexes of Salen-Type Ligands, *Molecules* **2019**, 24(13), 2514.