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Schiff Base Ligands and Their Multiple Applications

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The specific arrangement and the compartmentalization of metal ions are highly interesting for research in biology and material sciences. In order to program the coordination of two different metal ions, functional coordinating sections of ligands can be generated by design, leading to tweezer-type complexes with new properties stemming from the combination of the different metal ions. Moreover, the compartmentalization of certain metal ions in compounds such as coordination polymers, mono- and multimetallic complexes or oxide materials can produce a variety of structures with new or enhanced properties for potential mechanical, magnetic, optical or electrical applications.

This project consists in the design of specific ligands with specific coordination sites to selectively bind different metal ions. The H_2L ligand, a Schiff base derivative, has been synthesized. It possesses a central coordination site made of an imine-based N_2O_2 entity used to coordinate Cu(II) or Ni(II) under deprotonation. This metal binding event prearranges the ligand into a Ω-shape, generating thus a second recognition site, O_2O_2, composed by two phenoxy and two methoxy functions. The coordination of hard metal ions (alkali, alkaline earth, etc.) becomes thus more favourable, and different types of coordination in solution and/or in the solid state can be expected, depending on the size of the metal ion to be coordinated in the O_2O_2 site, the choice of the counter ion, and the solvent.

Structural differences influenced by the use of different kinds of metal ions have been observed for Cu(II) and Ni(II) compounds (metalloligands) using single crystal X-ray diffraction. Indeed, the copper ion is preferentially coordinated in a square pyramidal or distorted octahedral coordination, while the nickel ion tends to adopt a quasi-perfect square planar configuration.

Therefore, the different proprieties of the new mixed metal complexes obtained were investigated for further potential applications. Their biocidic activity, their sensing aptitude for ion detection in solution and their ability to produce mixed metal oxide precursors were explored.

Jury:

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