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Binuclear Complexes and Their Applications in the Industrial Sector

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Short Communication

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ABSTRACT

Advancement of coordinated complexes for optoelectronic products is a rich area of scientific research. In contrast to the research on mononuclear complexes, binuclear complexation species are less explored, and their wide applicability is under-searched. Nevertheless, binuclear coordinated complexes have special functional assets compared to their mononuclear analogue, as the bridging and cyclic ligands, or the transition metal centers can be well-tuned.

In the past few years, binucleated complex species have made important breakthroughs in the challenging areas of OLEDs, CO_2 reduction, chemosensors, biosensors and smart materials. A complete understanding on the recent developments of binuclear metal coordination chemistry and their applications is the need of hour in the current scenario.

A complete understanding on the recent developments of binuclear metal coordination chemistry and their applications is the need of hour in the current scenario. However, there are few challenges faced in the development of these binucleated complexes and are listed below:

INTRODUCTION

For majority of the applications, it is mandate that the macrocyclic ligands are likely to be available readily, are cheap, and can be prepared easily. In this direction of thought, calix[n]arenes are known to be potential candidates. They are macrocyclic in nature, consisting of phenolicunits joined by -CH_2- bridges at o-positions and the -OH functional groups are primed to harmonize numerous transition metals in a simultaneous manner. Moreover, they can be structured via their conformational flexibility with shape-specific π-rich cavities adept of metal···π-arene coordination. A paramount understanding on higher-order complexation can be obtained by studying the multi-organo-metallic calixarenes formed by O-phenolate chelation, and also those formed through a unique amalgamation of O-phenolate and metal···π-arene coordination thereby illustrating the control over the stoichiometries of the coordinated complexes. On other hand, metal complexes of highly functionalized calixarenes (like p-sulfonated and O-derivatives) are also known and are generally akin to classical Werner's coordination chemistry. Furthermore, the future prospects towards building new complex structures of multi-dimensional complexity primarily relates towards the control of the calixarene conformation; any strategic change in the conformation state can prefer the advantage of considering one transition metal type over the other another metal type, which also has a high degree of dependence on the coordination chemistry and the stereochemistry of the functionalized and complex ligands. In addition to the binuclear coordination chemistry, the number of permutations and combinations of transition metals for ternary and higher systems is an extremely large set, where the metal surrounded by ligands of variety

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of ring sizes, distinct categories of alkyl and arylsubstituents on the rings can be the outlook for research in the coming period of time. The synthetic routes need to be optimized to manufacture these high-end multifunctionality chemicals for a variety of industrial research applications [1,2].

CONCLUSION

Complexation involving multi-metal centres with complex ligands have a critical role to play for various applications like OLEDs and materials for smart technologies. However, lack of understanding on the structure of the complex moiety can lead towards incomplete understanding for the desired application.

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