CONCLUSION

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The present work has been carried out with the aim to synthesize new magnetic systems in mild condition, with specific magnetic and molecular properties that might be suitable for future applications and is to provide the theoretical underpinning for designing such structures.

The present work is therefore encouraging and stimulating the underlying research, trying in particular to respond to the great need for a much stronger fundamental science base to underpin the development of materials suitable for practical devices and useful applications in the future.

One of the great attractions of the whole field is the potential to build compounds that behave as classical solid-state magnets while exhibiting completely new properties, such as a wide range of magnetic ordering temperatures so that the relationship between magnetism and temperature can be precisely controlled.

The present study is expected to add to the understanding of magnetic exchange phenomenon in multinuclear systems. The electronic and geometrical parameters related to the bridging and non-bridging parts of the complex molecules have been studied. Especially the effect of π geometrical parameters, torsional angle between metal coordination planes in mediating the exchange process has been investigated in detail.

It has been observed that

1. The variation in functional groups on the non bridging part of the ligand as well as a minor variation in the bridging group can affect the molecular geometry and hence can have significant effect on the extent of spin exchange between paramagnetic centers through long multiatomic bridges. It is observed that small variation in bridging functionality from $-CH_2-$, $-SO_2-$, and $-O-$ have significant effect on the magnetic property.

As the deviation in torsional angle between the metal coordination planes increases from planarity in the order,

$[Cu_2(salDPM)_2] < [Cu_2(sal4\text{-}DPS)_2] < [Cu_2(salDPE)_2]$

the value of J also increase in the same order.

2. The systematic variation in the non bridging part of the ligands in binuclear complexes can modulate the extent of magnetic exchange. The variation in these groups can be used to change the tortional angle and there by tune the magnetic property to any desired value from ferromagnetism to antiferromagnetism.

It has been observed that on varying the non bridging ligand, the deviation in the torsional angle increases in the order $[Cu_2(salDPM)_2] < [Cu_2(naphDPM)_2] < [Cu_2(vanDPM)_2] < [Cu_2(BrsalDPM)_2]$ and the value of J also increase indicating increase in ferromagnetism with increase in non planarity.

3. In complexes with σ-bonding bridges, the results show that the bulkier and more π-bonding ligands can distort the metal coordination planes to a greater extent and hence lead to stronger ferromagnetism. At the same time it promises their use as molecular ferromagnets.

4. The examination of biological activity showed that the complexes have much better activity than the corresponding ligands. The antibacterial activity showed by the ligands and their complexes is either comparable or slightly mediocre as compared to biological activity against known antibiotics, commonly used in clinical practice.

The fuller understanding of the effect of structural parameters which affect the spin/electron exchange in these systems can lead to "Tailor making" of the molecular magnetic materials and further in the development of multi-metallic catalysts to suit the needs for specific industrial applications. A comparison with the theoretical models will be a step towards "outside the laboratory" design of molecules having desired magnetic, redox or catalytic properties