



# METALLA-TOPOMERS OF SUPRAMOLECULAR HOST-GUEST COMPOUNDS



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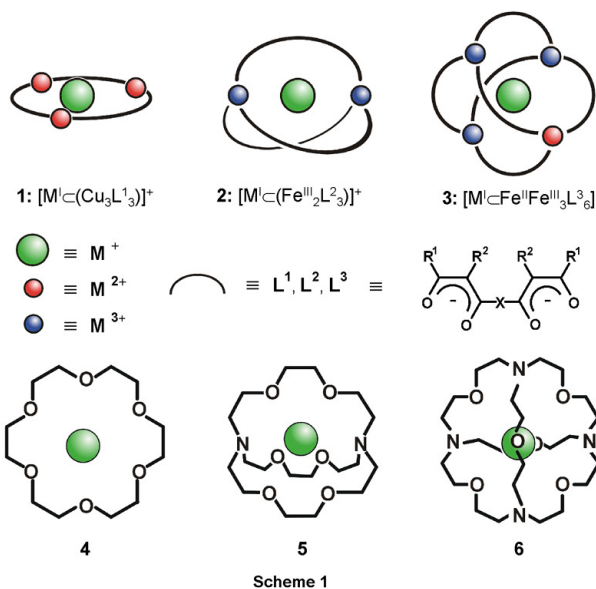
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## Introduction

Most of the supramolecular systems which became generally known in the past, trace back to serendipitous discoveries. However, more recently a concept to rationally design oligonuclear metal clusters was developed.

## Synthesis

According to a procedure developed in our laboratories, the metalla-topomers **1-3** of the well known coronates **4** and cryptates **5, 6** can be prepared in a one-pot reaction in gram scale. (Scheme 1).<sup>[1-3]</sup> In comparison with the conventional *N*-linked bi- and tricyclic supramolecular structures **5** and **6** the new clusters **2** and **3** feature that in their cases metal ions function as bridgeheads.



In contrast to their mere organic counterparts **4-6**, according to the extra metal ions, the clusters **1-3** exhibit additional spectroscopic, electronic (Fig. 1), magnetic, and catalytic properties.

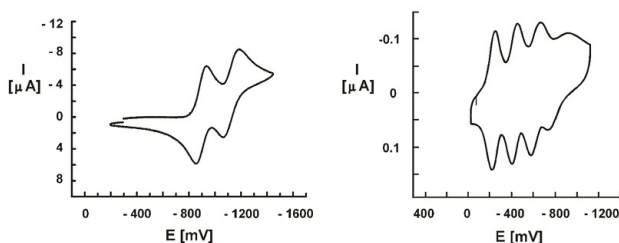


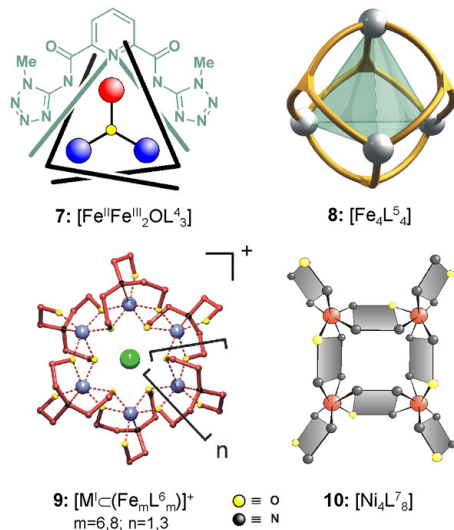
Fig. 1: Cyclic voltammograms: Cluster Type 2 (left), Cluster Type 3 (right).

## Properties

The new clusters of type **1-3** (Scheme 1) and **7-10** (Scheme 2) were studied in detail particularly with respect to their redox, magnetic, and catalytic properties.<sup>[4]</sup>

Some examples are given below:

- ◆ Investigations on the influence of the ligands and the endohedrally encapsulated cations on the redox properties of the different homonuclear di-, tri-, tetra-, and hexanuclear iron clusters were carried out by cyclic voltammetry and Mössbauer spectroscopy.
- ◆ The detailed studies of the properties of the homonuclear iron systems were extended to the corresponding mixed-valence and heteronuclear clusters.
- ◆ In order to find so-called molecular magnets, magnetic measurements were carried out with the clusters **9** (antiferromagnetic coupling) and **10** (ferromagnetic coupling).
- ◆ The mixed valent iron clusters turned out to be potential catalysts for the epoxidation of unfunctionalized olefins with di-oxygen at ambient conditions.



## Literature

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- [2] E. Uller, B. Demleitner, I. Bernt, R. W. Saalfrank, *Synergistic Effect of Serendipity and Rational Design in Supramolecular Chemistry* (Hersg.: M. Fujita), Vol. 96, 2000, S. 149-175, zit. Lit.
- [3] R. W. Saalfrank, N. Löw, B. Demleitner, D. Stalke, M. Teichert, *Chem. Eur. J.* 1998, 4, 1305; R. W. Saalfrank, N. Löw, S. Kareth, V. Seitz, F. Hampel, D. Stalke, M. Teichert, *Angew. Chem.* 1998, 110, 182; R. W. Saalfrank, N. Löw, F. Hampel, H.-D. Stachel, *Angew. Chem.* 1996, 108, 2353; R. W. Saalfrank, S. Trummer, U. Reimann, M. Chowdhry, F. Hampel, O. Waldmann, *Angew. Chem.* 2000, 112, 3634; R. W. Saalfrank, I. Bernt, E. Uller, F. Hampel, *Angew. Chem.* 1997, 109, 2596.
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