Dynamics in Metal Clusters: Reactivity and Chirality

Abstract

The talk highlights a few recent findings on the dynamics of atomically precise nanoscale materials leading to unexpected chemical and chiroptical properties. Ligand-protected molecular metal clusters[1] are used as model for this purpose. There are clusters of several materials available, however, the reactions *between* them, are extremely rare. The first part of the talk presents unusual spontaneous exchange chemistry *between* metal clusters[2,3] resulting from their structural dynamics. The second part showcases a promising combined circular dichroism (CD)-circularly polarized luminescence (CPL) investigation to unravel the structure-chiroptical properties of metal clusters.[4, 5] This is the first attempt to use CD and CPL spectroscopy to probe the origin of electronic transitions for any nanomaterial. I will also discuss unprecedented, dynamic chiroptical properties of DNA-templated metal clusters with tunable chirality and circularly polarized luminescence.[6] The third part presents my future research directions involving fluorescence spectroscopy and chiroptical properties of nanomaterials. This part includes (i) circularly polarized luminescent biomaterials: assemblies, gels and spin selective transport, (ii) design of inter-cluster chiral compounds (for spin-selective electron transport), (iii) chiral patterning and assembly for cheaper substrates for enantiomer separation and for circularly polarized luminescence materials, (iv) probing chiral interfaces for energy/electron transfer, enantioselective catalysis and sensing.

References

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