Non-statistical Assembly of Functional Coordination Cages

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Advanced self-assembly strategies enable the targeted synthesis of supramolecular systems and materials with increasing structural and functional complexity. We use bis-monodentate ligands, reacting with transition metal cations such as Pd(II) to coordination compounds with a broad range of topologies from small Pd_2L_4 cages, their interpenetrated dimers, rings of various size up to large $Pd_{24}L_{48}$ spheres.[1] We introduce stimuli-responsive behaviour triggered by small molecules or light leading to the modulation of guest affinity[2] or complete structural reorganization (Figure a).[3] Interpenetrated double cages consisting of donor and acceptor moieties were shown to undergo light-induced charge separation but suffer from a lack of control over stoichiometry and stereochemistry (Figure b).[4] Therefore, we develop various approaches to control the non-statistical assembly of heteroleptic cages with defined structure and composition (e.g. “geometric shape complementarity”; Figure c).[5] Recently, we established guest-to-host[6] and ligand-to-ligand chirality transfer, monitored by CD and CPL spectroscopy. We further present early results on intra-cage charge and energy transfer.

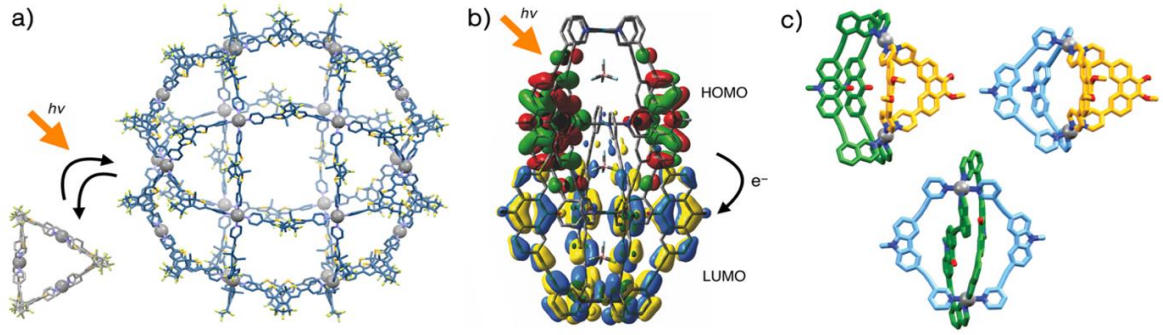

Figure: a), b) Light-responsive and c) heteroleptic coordination cages.

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