

Control of functional materials and supramolecular network dynamics at both the molecular and colloidal length scales

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Cucurbit[*n*]urils (CB[*n*]) are macrocyclic molecules made of glycoluril monomers linked by methylene bridges, where *n* is the number of glycoluril units. CB[*n*] are excellent host molecules as they form stable yet dynamic complexes with guest compounds in aqueous media with extremely high affinity. The larger homologue CB[8] is capable of simultaneously accommodating two guests to form either 1:1:1 heteroternary or 2:1 homoternary complexes with association constants up to 10^{15} M^{-2} through multiple non-covalent interactions.^[1] Our group has exploited CB[8]'s unique host-guest binding properties as a linking motif to prepare supramolecular polymers, micelles, hydrogels, microcapsules, hierarchical structured colloids and colloid/polymer hybrid materials.^[1-5] The interactions of CB[*n*] with gold colloids has also been an area of interest within the group. The use of CB[*n*] as a molecular ruler to control the aggregation of Au NPs and subsequently bind and detect analyte molecules at room temperature within their cavity is a major area of research in the group.⁶ Simple, robust CB[7]-AuNP constructs have shown the ability to detect neurotransmitters through the formation of 1:1 complexes using SERS. Moreover, this system is capable of performing quantitative multiplexing in biological media such as urine.⁷ In this lecture I will highlight recent advances we have made in controlling dynamic functional materials and sensors based on CB-mediated host-guest interactions.

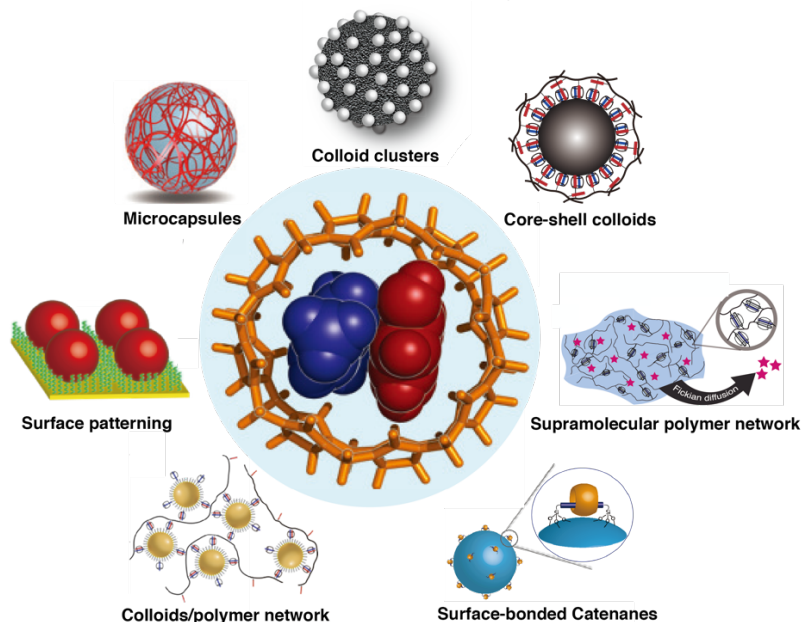


Figure 1: Functional materials based on CB[8]-mediated host-guest interactions at interfaces.

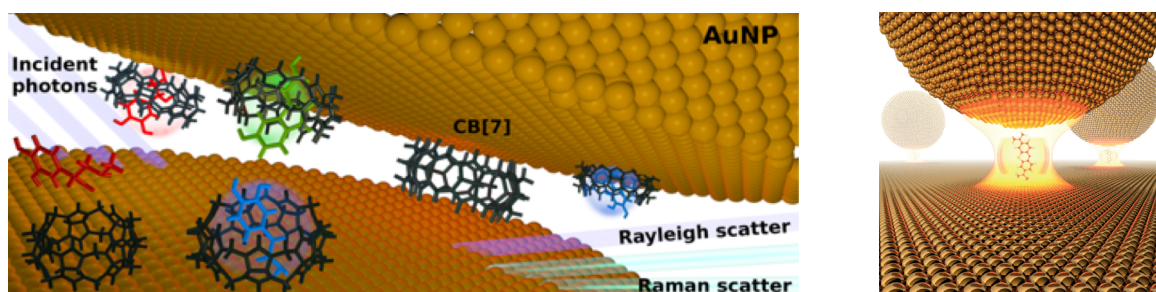


Figure 2: (Left) Multiplexing of neurotransmitters in CB[7]-Au NP aggregates. (Right) Single molecule detection at RT.

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