学术报告

题 目: **Functional Assemblies and Interfacial Dynamics with Cucurbiturils**

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固体表面物理化学国家重点实验室
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Functional Assemblies and Interfacial Dynamics with Cucurbiturils

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Abstract:

We are interested in the development of controlled polymer architectures, hybrid nanoparticle-soft matter assemblies and the integration of dynamic supramolecular systems at interfaces. Current research projects in the group include the application of macrocyclic host-guest chemistry using cucurbit[n]urils in the development of novel microcapsules, supramolecular hydrogels, drug-delivery systems based on dynamic hydrogels, adhesion between a variety of surfaces, the conservation and restoration of important historical artefacts[1a] through the exploitation of supramolecular polymer chemistry and sensing and catalysis using self-assembled nanophotonic systems.

Modification of solution viscosity using multivalent polymers has been accomplished through dynamic cross-linking in water using CB[8]. These hydrogels, with extremely high water content (up to 99.75% water by weight), have also been prepared by utilising renewable cellulose derivatives. Their rapid formation[1b] and shear-induced flow properties make these materials perfectly suited for use as injectable hydrogels for delivery of therapeutics.

Polymer-inorganic composite materials can be readily prepared based on the CB[8] coupling of multivalent gold nanoparticles (AuNPs) to functional copolymers. When these systems are attached onto gold surfaces intricate control is achieved over the site-selective immobilization of colloids and peptides. This has great scope for the development of optical materials, chemical sensors[2] and biological separations. Additionally, we have developed an innovative new technique for manufacturing 'smart' microcapsules in large quantities using continuous flow in a single step from tiny droplets of water.[3a] The major advantage of this manufacturing platform over current methods is that a variety of cargos can be efficiently loaded during the microcapsule formation at room temperature, and the dynamic supramolecular interactions provide control over the porosity of the capsules and the timed release of their contents using stimuli.[3b] Our CB[n] based host-guest systems exhibit dynamic self assembly and are capable of responding to stimuli (photochemical, chemical, and thermal) allowing for external control and function to be built into the materials.

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2. (a) Kasera, S.; Herrmann, L.O.; del Barrio, J.; Baumberg, J.J.; Scherman, O.A. "Quantitative Multiplexing with Nano-Self-Assemblies in SERS," *Sci. Rep.*, **2014**, *4*, 6785. (b) Herrmann, L.O.; Valev, V.K.; Tserkezis, C.; Barnard, J.S.; Kasera, S.; Scherman, O.A.; Aizpurua, J.; Baumberg, J.J. "Threading Plasmonic Nanoparticle Strings with Light," *Nat. Commun.*, **2014**, *5*, 4568.

3. (a) Zheng, Y.; Yu, Z.; Parker, R.M.; Wu, Y.; Abell, C.; Scherman, O.A. "Interfacial assembly of dendritic microcapsules with host–guest chemistry" *Nat. Commun.* **2014**, *5*, *5772*. (b) Zhang, J.; Coulston, R.J.; Jones, S.T.; Geng, J.; Scherman, O.A.*; Abell, C.* "One-Step Fabrication of Supramolecular Microcapsules from Microfluidic Droplets," *Science*, **2012**, *335*, 690–694.