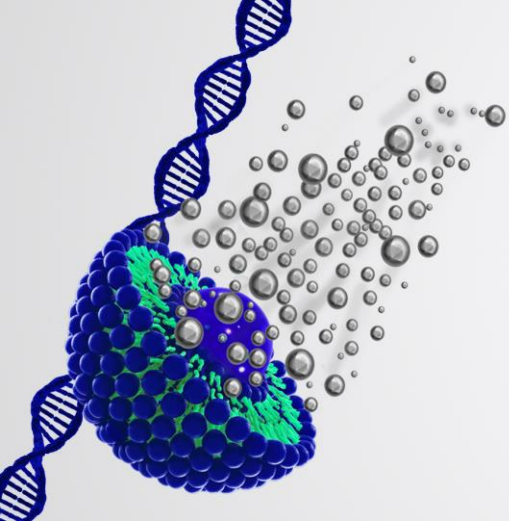

SUPRABIO 2019

International Symposium on SupraBiomolecular Systems

May 15 - 17 2019 | Barcelona

Ion Pair Receptors: From Recognition and Transport to Logic and Self-assembly

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A major goal of this research program has been to design and prepare so-called ion pair receptors, where both anion and cation are co-bound within a given molecular framework. The creation of ion pair receptors with unique binding characteristics permits a higher level of control and the targeting specific anion or cation binding in the presence of their corresponding counterion. By enforcing electroneutrality by means of modifying the framework of a macrocycle known as calix[4]pyrrole, we have developed ion pair receptors that may be used for extraction, as well as for the through-membrane transport of ions. The first area targets environmental remediation, whereas the latter may permit a new approach to drug discovery.
Using anion receptors, we are also developing on new strategies for self-assembly. Here, electron rich calix[*4*]pyrroles have proved useful; they have permitted studies of self-assembly and switching. In these systems, anion binding serves to toggle the fundamental conformation of the core receptor so as to control both ion recognition and self-assembly. This allows the production of monomers, capsules, and oligomers via the judicious choice of calix[4]pyrrole, anion, cation, solvent, and targeted substrate. It also permits control over charge transfer interactions and the construction of multi-state molecular logic devices. One of these has permitted inter-species "chemical communication".
This work was made possible by the dedicated efforts of many coworkers and collaborators who will be thanked during the presentation. Support from the U.S. National Science Foundation, US National Institutes of Health, the US Department of Energy, and the Robert A. Welch Foundation is acknowledged. Funding has also come from Shanghai University. Productive collaborations with a number of groups, including that of Dr. Bruce Moyer at ORNL, Jan Jeppesen (University of South Denmark), Jung Su Park (Sookmyung University), and Feihe Huang (Zhejiang University), are gratefully acknowledged.

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