



Plenary 11

Bio-inspired Approach to Synthetic Containers and Sensors

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Two bio-inspired projects are described: the first is inspired by the general structure of the spherical virus particles in an effort to synthesize molecular containers by self-assembly of pentagonal organic molecules. The second is inspired by the biological principle of interconnected cascades of binding equilibria in an effort to construct specific chemical sensors.

Synthetic capsids. By examining physical models of spherical virus particles and using tools of molecular dynamics simulation, we have arrived at a general synthetic strategy for producing chemical capsids at size scales between fullerenes and spherical viruses [1]. Such capsids can be formed by self-assembly of pentagonal molecules based on the corannulene core and equipped with specific binding mechanisms, including hydrogen bonding, metal binding and disulfide bonds. The non-trivial synthesis of the pentagonal tiles was achieved via new metal-catalyzed corannulene chemistry [2,3].

Switchable cucurbituril beacon. The inclusion complexes between 4-aminobipyridine derivatives and cucurbit[6]uril were found to exhibit remarkable enhancements of fluorescence intensity and quantum yields. This reversible binding phenomenon was used for the design of switchable beacons that can be incorporated within cascades of binding networks that have many potential applications, such as chemical sensors, direct measurement of binding constants and quantitative monitoring of biocatalytic reactions [4].

1. A. J. Olson, Y. H. E. Hu, E. Keinan. *Proc. Natl. Acad. Sci. USA* **2007**, *104*, 20731.
2. D. Pappo, T. Mejuch, O. Reany, E. Solel, M. Gurram, E. Keinan. *Org. Lett.*, **2009**, *11*, 1063.
3. R. Gershoni-Poranne, D. Pappo, E. Solel, E. Keinan. *Org. Lett.*, **2009**, accepted.
4. M. K. Sinha O. Reany, G. Parvari, A. Karmakar, E. Keinan. *Chem. Eur. J.* **2009**, accepted.