

Chemical Science Colloquium

Speaker: Prof. Dr. Bart Jan Ravoo, Organic Chemistry Institute and Center for Soft Nanoscience
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Title: Responsive soft materials made by supramolecular self-assembly

Date: February 16, 2018

Venue : S N Bose Hall

Time: 3:30 PM

Abstract: Self-assembly is emerging as a superior method to prepare adaptive and responsive nanomaterials. The structure and function of these materials is entirely determined by the dynamic and weak interactions of the constituent molecular "building blocks" of the material. Since the inherent interactions are weak, these versatile materials readily respond to even small changes and stimuli in their environment. Moreover, these materials are biomimetic and contain large amounts of water, so that application in biomedical technology can be foreseen.

This lecture will highlight self-assembled nanocontainers based on cyclodextrins that respond to various external stimuli. Amphiphilic cyclodextrins form bilayer vesicles in aqueous solution and the surface of these vesicles can be functionalized using hostguest chemistry. Shear-thinning hydrogels result if the cyclodextrin vesicles are mixed with adamantane-functionalized polymers, which act as supramolecular cross-linkers. Photo-triggered payload release from supramolecular hydrogels is enabled by incorporation of azo-modified peptides. Polymer-shelled vesicles and polymer nanocontainers are obtained if the cyclodextrin vesicles are decorated with adamantaneterminated poly(acrylic acid), which can be cross-linked with diamines. Recently, we have also shown that this polymer shell is redox-responsive if the cross-linker contains a disulfide unit. The resulting nanocontainer can deliver cargo into cells.

Furthermore, the lecture will include several examples of the transfer of the concept of stimulus-responsive assembly to nanoparticles and nanofilms.

References:

- [1] Himmelein, S.; Lewe, V.; Stuart, M.C.A.; Ravoo, B.J. *Chem. Sci.* 2014, 5, 1054.
- [2] Stricker, L.; Fritz, E.C.; Peterlechner, M.; Doltsinis, N.L.; Ravoo, B.J. *J. Am. Chem. Soc.* 2016, 138, 4547.
- [3] De Vries, W.C.; Grill, D.; Tesch, M.; Ricker, A.; Nusse, H.; Klingauf, J.; Studer, A.; Gerke, V.; Ravoo, B.J. *Angew. Chem. Int. Ed.* 2017, 56, 9603.
- [4] Chu, C.W.; Ravoo, B.J. *Chem. Commun.* 2017, 53, 12450-12453.

All are cordially invited to attend the seminar