

In Situ Hierarchical Formation of Giant Amphiphile Bionanoreactors

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Amphiphilic protein-polymer chimeras –the so-called *Giant Amphiphiles*- are designed to mimic the hierarchical self-assembly displayed both in biological and synthetic material systems over a range of lengths. During the last years we synthesized and characterized several such protein-polymer amphiphilic bioconjugates through a series of different synthetic approaches varying from the direct coupling of end-functionalized polymers to proteins, to the grafting of polymers from protein macroinitiators.[1,2,3] Interestingly, Giant Amphiphiles have shown to assemble into well-defined, functional superstructures suitable for a variety of materials applications. Different synthetic approaches, including the Atom Transfer Radical Polymerization (ATRP) [2] and the Ring Opening Polymerization (ROP)[3] *grafting of a series of monomers from protein biomacroinitiators* will be comparatively presented in this lecture (Figure 1). It will be shown that these methods drastically improve synthetic yields and allow studying of the self-assembling behaviour and functionality of *Giant Amphiphiles* in unprecedented detail. More importantly, the *in situ* formation of multifunctional nanoreactors with interesting catalytic properties and significant application potential will be presented. Special focus will be placed on the synthesis of a novel series of biocompatible, degradable and/or responsive giant soaps. The functionality, self-assembling and self-destructing properties of the new bioconjugates will be discussed.

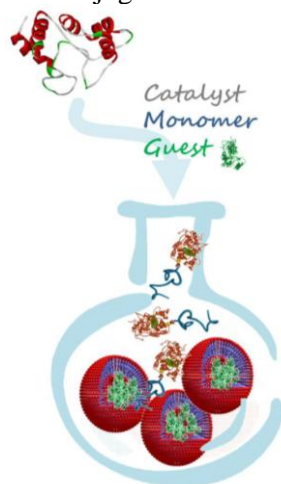


Figure 1: *In situ*, hierarchical formation of *Giant Amphiphile* bionanoreactors

References

- [1] Velonia, Rowan and Nolte, *J. Am. Chem. Soc.* **124**, 4224 (2002); Le Droumaguet, Mantovani, Haddleton and Velonia, *J. Mater. Chem.* **17**, 1916, (2007).
- [2] Le Droumaguet and Velonia, *Angew. Chem., Int. Ed.*, **47**, 6263, (2008).
- [3] Liasas, Daskalaki, Al Tabchi, V. Dacros, K. Velonia et al., *submitted*.