

Formation of giant amphiphiles by post-functionalization of hydrophilic polymers

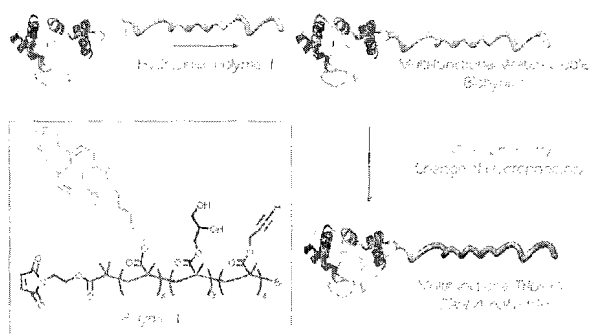
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The specific functionalization of proteins with synthetic polymers (1) such as polyethylene glycols, hydrophilic polymethacrylates, polystyrenes, etc...) aiming at the formation of well-defined, functional and structural biomaterials is a promising area of research. More specifically, the attachment of hydrophobic polymers such as polystyrene to a protein/enzyme to form the so called Giant Amphiphiles, has led to functional nanoassemblies with aggregation properties similar to those of their low molecular weight counterparts (e.g. phospholipids, block copolymers).

A novel, generic synthetic approach leading to the first tri-block protein-polymer Giant Amphiphiles is introduced here (2). We designed and synthesized a multifunctional hydrophilic poly-1-alkyne polymer (I) which was initially coupled to proteins to form hydrophilic multi-functional tri-block biohybrids. Following the newly developed *post-functionalization* approach, hydrophobicity was introduced by a subsequent multi-“clicking” cycloaddition step ([3+2] Huisgen cycloaddition).



Herein we report on the family of Giant Amphiphiles resulting from the coupling of a variety of azide appended derivatives (R = n-decane, benzyl, pentafluorobenzyl, thymine) to BSA multifunctional biohybrids following the above mentioned novel approach. A comparative study of the self-assembling behaviour of these macromolecules revealed interesting differences in the aggregation, depending on the nature of the hydrophobic derivative clicked on the polymer backbone.

References

- (1) Thordarson, P ; Le Droumaguet, B. ; Velonia K. ; *J. App. Microbiol. Biotechnol.* **2006**, 73, 243-254.
- (2) Le Droumaguet, B. ; Mantovani, G. ; Haddleton, D.M. ; Velonia, K. ; *J. Mater. Chem.* **2007**, 17, 1916-1922.