In Situ Formation of Protein-Polymer Giant Amphiphiles using ATRP Polymerization.

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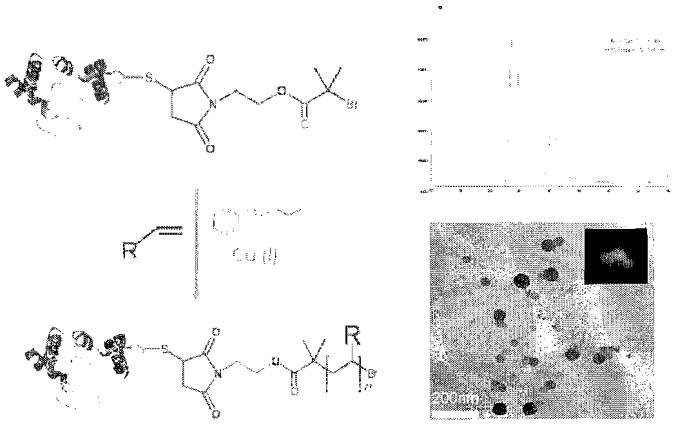
Due to their widespread utility in medical applications, biotechnology, and nanotechnology, polymer-protein conjugates are in the forefront of chemical research. During the last decades they have been prepared by conjugation of pre-functionalized polymers to biomolecules through covalent and/or bioaffinity bindings, approaches that often involve multiple steps of synthesis, chemical modification, tedious purification, and conjugation.
A novel strategy eliminating these multistep procedures and leading to well-defined polymer-protein conjugates has recently been introduced [1]. By using appropriately modified proteins as initiating sites for ATRP or RAFT polymerization, a variety of hydrophilic bioconjugates has been synthesized and characterized [1].



Our studies have focused on extending this concept to the formation of *Giant Amphiphiles*, i.e. biohybrids comprising a protein specifically connected to a hydrophobic polymer (e.g. polystyrene) or other multifunctional polymers [2]. With the use of a macro-initiator functionalized protein and the appropriate hydrophobic monomer, we were able to achieve ATRP polymerization starting from the protein. Furthermore, our results show that the degree of polymerization is controlled by the excess of the monomer utilized as well as by the formation of the giant amphiphilic biohybrids and their concurrent aggregation. The first multi-enzyme systems as well as the formation of vesicular nanoreactors containing proteins, will be presented.

References

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