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Fabrication of polymer-protein hybrids

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In recent years, fabrications of polymer-protein hybrids with multiresponsiveness have been attracting increasing attention. In our group, we designed triple-responsive polymer-protein networks based on molecular recognition. Reduced bovine serum albumin (BSA) was modified with multiple β-cyclodextrin (βCD) by thiol-disulfide exchange reaction. The βCD-modified BSA was added into the aqueous solution of acrylamide copolymer with pendant adamantyl group, resulting in the formation of triple-responsive polymer-protein network structures. We also synthesized virus-mimicking protein nanogels with temperature-induced reversible structures and redox responsiveness by crosslinking a thermally responsive polymer poly(di-ethylene glycol) methyl ether methacrylate-co-2-(2-pyridyldisulfide)ethyl methacrylate) with reduced BSA molecules through thiol-disulfide exchange reaction. The lower critical solution temperature (LCST) and sizes of the nanogels can be controlled by controlling the reaction conditions. Co-assembly of positively charged patchy micelles and negatively charged BSA molecules into hybrid vesicles was also investigated. The patchy micelles, which were synthesized using block copolymer brushes as templates, leads to co-assembly with protein molecules into vesicular structures. The average size of the assembled structures can be controlled by the molar ratio of BSA to patchy micelles.

Biography

Hanying Zhao is a Professor in the College of Chemistry, Nankai University. He received his PhD in Macromolecular Chemistry and Physics from Changchun Institute of Applied Chemistry, Chinese Academy of Sciences in 1997 with Prof. Baotong Huang, and carried out Post-doctoral researches at Fudan University, Institute of Polymer Research Dresden, University of Florida and Clarkson University. His research interests are in the synthesis and self-assembly of polymers with different topological structures, polymer brushes, polymer-protein hybrids and polymer nanocomposites.

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