Amphiphilic diblock copolymers for molecular recognition: metal-nitrilotriacetic acid functionalized vesicles

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Here we describe the design, synthesis, and characterization of new, metal-functionalized, amphiphilic diblock copolymers for molecular recognition. Polybutadiene-block-polyethylenoxide copolymers were synthesized by living anionic polymerization and end group functionalized with nitrilotriacetic acid and tris(nitrilotriacetic acid). After complexation with nickel and copper, these groups are known to selectively bind to oligohistidine residues of proteins. The polymers were characterized by H-1 NMR spectroscopy, size exclusion chromatography, electron paramagnetic resonance, and UV-vis spectroscopy. Mixtures of these polymers with the respective nonfunctionalized block copolymers self-assemble in aqueous solution into vesicular structures with a controlled density of the metal complex end-groups on their surface. The accessibility of these binding sites was tested using maltose binding protein carrying a terminal decahistidine moiety and His-tagged enhanced green fluorescent protein as model systems. Fluorescence correlation spectroscopy clearly showed a significant and selective binding of these proteins to the vesicle surface.
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