Programming and regulating self-assembly of biohybrid polymers: Routes to enlarge the structural and functional space of soft matter

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You are welcome to meet Pr. Hans Börner, do not hesitate to contact Jean-François Lutz (jflutz@unistra.fr).

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The combination of monomer-sequence defined peptides and synthetic polymers proved to result in an interesting class of multifunctional block copolymers.[1, 2] The defined amino acid sequence of peptides allows for encoding specific information into such peptide-polymer conjugates.[3]

While the generation of specific functions in bioconjugates i. e. programming the self-assembly of bioconjugates has been in the focus of prior work,[4, 5] the regulation of such functions get mandatory.[6] For instance, the peptide-guided organization process of bioconjugates was developed further by introducing a "switch" concept that allows to control the rates of aggregation via pH (Figure).[7] This provides a handle to regulate the aggregation kinetics of bioconjugates in water and organic solvents.[7-9] With respect to the design of potent regulative mechanisms enzymatic processing has been evaluated, too. Based on this, a "BioSwitch" strategy was established that utilizes enzymes to specifically modulate properties of peptide segments in peptide-polymer conjugates.[10] Moreover Calcium ions have been exploited as triggers to screen peptide charges, amplification of the effect was found by switching the peptide secondary structure that leads to reversible control of self-assembly of bioconjugates. Disassembly was feasible by controlling the Ca^{2+}-levels via competitive Ca^{2+}-binders.[11]

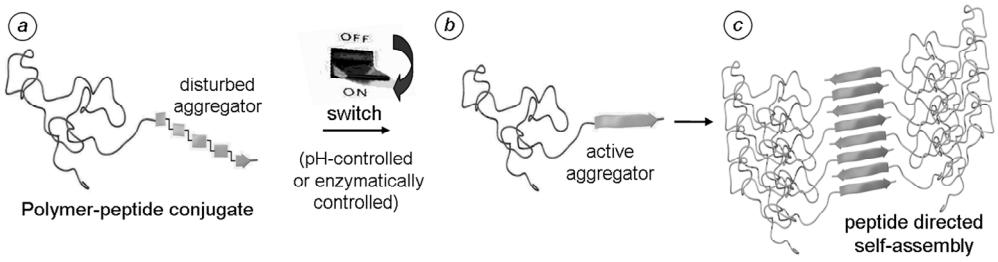

Figure. Triggering the peptide-guided organization in polymer-peptide conjugates ((a) polymer-peptide conjugate, exhibiting a disturbed aggregator domain (OFF); (b) conjugate with active aggregator domain (ON) and (c) formation of peptide-polymer nanotapes).

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