NANOMOTORS VIA A POLYMERIC SUPRAMOLECULAR APPROACH

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ABSTRACT

Self-powered artificial motile systems are currently attracting increased interest as mimics of biological motors but also as potential components of nanomachinery, robotics, and sensing devices. [1] Herein we report a supramolecular approach to design synthetic nanomotors using self-assembly of amphiphilic block copolymers into polymersomes and the controlled folding of the vesicles under osmotic stress into a bowl shape morphology.[2,3] During this process active catalysts such as platinum nanoparticles can be incorporated inside of the structures. The folding process can be precisely controlled to generate architectures with adjustable openings and selective entrapment of catalysts. The structure has an asymmetric morphology with the catalyst incorporated inside and with a small opening. Decomposition of the substrate by the active catalyst, in this case platinum nanoparticles, generates a rapid discharge of oxygen propelling the construct forward. Using a similar approach I will show that not only PtNP can be incorporated into effective nanomotors but also enzymes and even multiple enzymes in fact up to 6 different enzymes working together in a metabolic pathway.[4,5] In this case even regulation of the speed and behaviour of the nanomotors is possible due to integration of regulatory feedback and feedforward loops designed to preserve energy and run the motors at even lower concentrations of fuel eg. 0.05 mM Glucose. This is the first example of a synthetic motile system able to sense the environment and based on the clues provided to adapt its behaviour and speed.[5,6] Furthermore recent developments on greater control over the movement of the nanomotors under chemical gradients or temperature will be presented.[4]

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