Photochemical energy conversion nanodevice based on P22 bacteriophage self-assembling nanocontainer encapsulating RC-LH1 and cyt *c*

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We engineered and *in vitro* assembled a biohybrid nano device for efficient photochemical energy conversion utilizing a self-organizing nanocontainer based on a *Salmonella thyphimurium* P22 virus procapsid's coat and scaffolding proteins. The tagged RC-LH1 photosynthetic complexes purified from *Cereibacter sphaeroides* and equine heart cytochrome c were fused to the N-terminus of the scaffolding protein *via* bi-functional linkers and encapsulated inside the nanocontainer's inner cargo space. The porous P22 bacteriophage procapsid shell of the nanocontainer device allowed for unrestricted access of the electron mediators (ascorbate, *p*-benzoquinone) to the photosynthetic complex sustaining the light activated electron. The light energy capture, charge transfer and catalytic efficiency of this nanocontainer device were monitored using optical spectroscopy and electrochemistry methods. This is the first step towards the development of modular molecular toolkit consisting of redox enzymes coupled to the photochemical energy conversion for production of high value chemical products.