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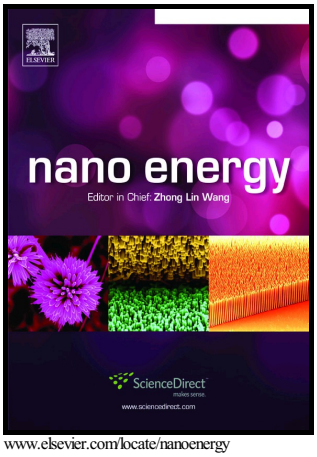

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Lu Zong, Mingjie Li, Chaoxu Li

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Intensifying solar-thermal harvest of low-dimension biologic nanostructures for electric power and solar desalination

Lu Zong,[a,b] *Mingjie Li*[a,*] *and Chaoxu Li*[a,b,*]

[a] CAS Key Laboratory of Bio-based materials, Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences, Songling Road 189, Qingdao 266101, P. R. China

[b] University of Chinese Academy of Sciences, 19A Yuquan Road, Beijing 100049, P. R. China

Chaoxu Li licx@qibebt.ac.cn
Mingjie Li limj@qibebt.ac.cn

*Corresponding authors:

Abstract

High-efficiency solar harvest and solar-thermal conversion have been targeted in modern sustainable energy science for diverse potential applications. However, broad applications with inorganic nanomaterials as solar-nanoheaters have suffered from low conversion efficiency, potential noxiousness and complicated synthesis procedures. Meanwhile, living organisms rely on delicate bio-synthesis of bio-macromolecules to produce organic bio-melanins with optimal nanostructures and solar-thermal properties for survival from harsh environments. Followed by this inspiration, alginate, one marine polysaccharide, is used to alter the polydopamine nanostructures, one artificial bio-melanin, from nanoparticles to high-aspect-ratio nanofibrils (diameter ~40 nm and aspect ratio up to 120 nm). During polymerization, alginate not only increases structural order (e.g. π-π conjugation) of polydopamine oligomers within their protoparticles, but also leads to linear consolidation of protoparticles. Polydopamine nanofibrils are found to exhibit super absorbance and high solar-thermal conversion efficiency (~86%) in full-range solar spectrum, being superior to