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Proton-Consumed Nanoarchitectures toward Sustainable and Efficient Photophosphorylation

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Abstract

At present, photophosphorylation in natural or artificial systems is accomplished by the production of protons or their pumping across the biomembranes. Herein, different from this strategy above, we demonstrate a designed system which can effectively enhance photophosphorylation by photo-induced proton-scavenging through molecular assembly. Upon the introduction of photobase generators, a (photo-) chemical reaction occurs to produce hydroxyl ions. Accompanying the further extramembranous acid-base neutralization reaction, an outbound flow of protons is generated to drive the reconstituted adenosine triphosphate (ATP) synthase to produce ATP. That is, contrary to biochemistry, the proton gradient to drive photophosphorylation derives from the scavenging of protons present in the external medium by hydroxyl ions, produced by the partially photo-induced splitting of photobase generator. Such assembled system holds great potential in ATP-consuming bioapplications.

Keywords: molecular assembly; nanoarchitectures; biomimetic synthesis; photophosphorylation; photobase

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