

Complete Procedure of Biochemical Reaction in Photolysis

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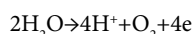
Abstract

The complete procedure of photolysis in photosynthesis is discussed in this paper. The complex ion tetrachloridomanganate (II) ion and the compound urea can play the roles in the analysis of water (H₂O).

Keywords: Photolysis; Complex ion; Photon; Photosystem; Electron; Chlorophyll; Water molecule

Introduction

Photolysis is an important part of photosynthesis. A complex compound [Mn²⁺Cl⁻] of Mn²⁺ and Cl⁻ ions can help to progress this process. But the nature of [Mn²⁺Cl⁻] and the pathway of photolysis are not known clearly at all. However modern inventions already show that to produce one molecule O₂, 2 molecules H₂O are analyzed; as well as 4H⁺ ions and 4e are also generated side by side in the complete procedure.

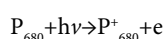


Here the mechanism of progressive pathway of photolysis is entirely discussed by the way of photoactive biochemical reactions.

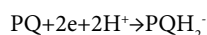
Photolysis

The complex ion tetrachloridomanganate (II) ion i.e., [MnCl₄]²⁻ of Mn²⁺ and Cl⁻ ions and the compound urea i.e., CO(NH₂)₂ are located in PS-II. [MnCl₄]²⁻ is photoactive and occurs photolysis by the helps of CO(NH₂)₂ and photon(hν) of light.

Chl-b (P₆₈₀) emits an electron (e) to convert itself as active chlorophyll i.e., Chl-b⁺ (P₆₈₀⁺) by absorption of photon and creates a strong electron-affinity in time of photosynthesis.

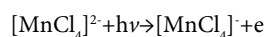


The above electron is accepted by electron- carrier plastoquinone (PQ) to stabilize active chlorophyll in PS-I i.e., Chl-a⁺ (P₇₀₀⁺) as the form Chl-a (P₇₀₀) via other electron-carriers (cytochrome b₆f complex and plastocyanine i.e., PC).

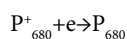


It is remembered that the H⁺ ion of above reaction can be accepted from stroma and thrown into lumen of chloroplast due to the electron-flow inside PQ for ATP synthesis by chemiosmosis.

In this situation, to decrease that electron-affinity [MnCl₄]²⁻ absorbs photon from light and converts itself as active tetrachloridomanganate (III) ion i.e., [MnCl₄]^{·-} by emission of an electron (e).

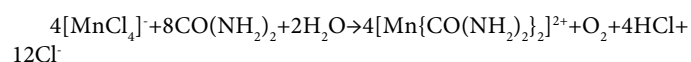


This electron can enter into PS-II to stabilize that active chlorophyll i.e., Chl-b⁺ (P₆₈₀⁺) to convert it into its stable state i.e., Chl-b (P₆₈₀).

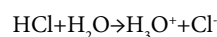


Now four active [MnCl₄]^{·-} ions can react with 8 molecules CO(NH₂)₂ and 2 water (H₂O) molecules to produce four diureamanganese (II) ions i.e., 4[Mn{CO(NH₂)₂]₂²⁺, four molecules hydrochloric acid i.e.,

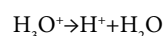
4HCl and twelve chlorine ions i.e., 12Cl⁻ for formation of one molecule oxygen i.e., O₂.



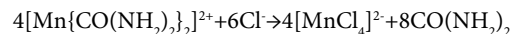
Then HCl attracts H₂O to generate hydronium ion i.e., H₃O⁺ and Cl⁻ in its hydrolysis.



After production of H₃O⁺, it is broken as H⁺ and H₂O to throw H⁺ into lumen cavity of chloroplast from PS-II.



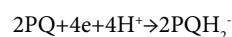
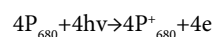
As a result, pH level inside PS-II can be increased; as well as concentration of Cl⁻ ion also be increase. In this situation, 4[Mn{CO(NH₂)₂]₂²⁺ ions and 16Cl⁻ ions can react with each other to reproduce 4[MnCl₄]²⁻ ions and 8 molecules CO(NH₂)₂.



Photoactive [MnCl₄]^{·-} again absorbs photon of light by the influence of the electron-affinity of active chlorophyll P₆₈₀⁺ (produced again from stable chlorophyll P₆₈₀ by absorption of photon of light and emitted electron again; which is again accepted by PQ in time of photosynthesis). In this way, the procedure of photolysis is going on in PS-II at the time of light reaction of photosynthesis [1-5].

Summary

The mechanism of the pathway of photolysis is clearly known in the above discussion. It is shown that finally 2 molecules H₂O is analyzed through this process to develop 4H⁺ ions and one molecule O₂. As well as four electrons (4e) are emitted by absorption of photons (hν) of light to restore the stability of active chlorophyll P₆₈₀⁺ as the form P₆₈₀. The complete reaction-pathway of photolysis is drawn by the following way:

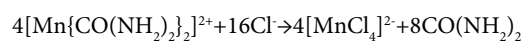
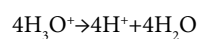
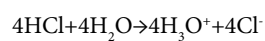
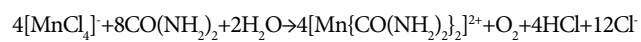
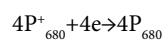
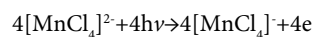


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