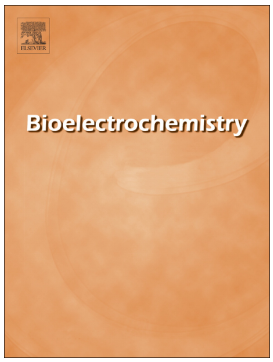

Enhancing extracellular electron transfer between Pseudomonas aeruginosa PAO1 and light driven semiconducting birnessite

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Enhancing Extracellular Electron Transfer between *Pseudomonas aeruginosa* PAO1 and Light Driven Semiconducting Birnessite

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Abstract: In recent years, considerable research effort has explored the interaction between semiconducting minerals and microorganisms, such relationship is a promising way to increase the efficiency of bioelectrochemical systems. Herein, the enhancement of electron transfer between birnessite photoanodes and *Pseudomonas aeruginosa* PAO1 under visible light was investigated. Under light illumination and positive bias, the light–birnessite–PAO1 electrochemical system generated a photocurrent of 279.57 μA/cm^2, which is 322% and 170% higher than those in the abiotic control and dead culture, suggesting photoenhanced electrochemical interaction between birnessite and *Pseudomonas*. The I–t curves presented repeatable responses to light on/off cycles, and multi-conditions analyses indicated that the enhanced photocurrent was attributed to the additional redox species associated with *P. aeruginosa* PAO1 and with the biofilm on birnessite. Electroconductibility analysis was conducted on the biofilm cellularly by conductive atomic force microscope. Pyocyanin was isolated as the biosynthesized extracellular shuttle and characterized by cyclic voltammetry and surface-enhanced Raman spectroscopy. Rapid bioelectron transfer driven by light was observed. The results suggest new opportunities for designing photo-bioelectronic devices and expanding our understanding of extracellular electron transfer with semiconducting minerals under light in nature environments.

Keywords: birnessite; *Pseudomonas aeruginosa*; extracellular electron transfer; light