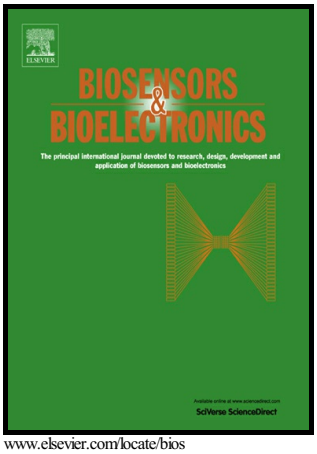

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Facilitated extracellular electron transfer of *Geobacter sulfurreducens* biofilm with *in situ* formed gold nanoparticles

Man Chen, Xiaofang Zhou, Xing Liu, Raymond Jianxiong Zeng, Fang Zhang, Jie Ye, Shungui Zhou*

Fujian Provincial Key Laboratory of Soil Environmental Health and Regulation, College of Resources and Environment, Fujian Agriculture and Forestry University, Fuzhou, Fujian 350002, China

*Corresponding author:

Prof. Shungui Zhou

Email address: sgzhou@ soil.gd.cn

Address: College of Resources and Environment, Fujian Agriculture and Forestry University, Fuzhou, Fujian 350002, China

Abstract:

The conductivity of a biofilm is the key factor for the high current density of a bioelectrochemical system (BES). Most previous works have focused on electrode modification, but, this only benefits the microorganisms that directly contact the electrode. The low conductivity of biofilm limits the current density of the BES. In this work, gold nanoparticles (Au-NPs) were successfully fabricated *in situ* into a *Geobacter sulfurreducens* biofilm to increase the conductivity. 20 ppm $NaAuCl_4$ (the precursor) was slowly dropped into the anode chamber at a rate of 1.3 mL/h in a continuous-flow three-electrode BES. The Au(III) was transformed to Au-NPs, which then precipitated in the biofilm *via* biological mineralization. The current density of the anode increased by 40%. Meanwhile, the removal percentage of the organic substrate (acetate) was enhanced 2.2 times, from 24.7% to 53.3%, after the *in situ* fabrication of Au-NPs. This method greatly lowered the charge transfer resistance of