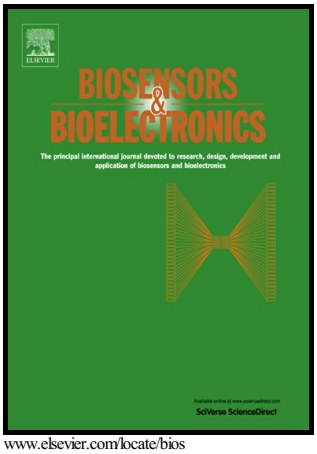

www.elsevier.com/locate/bios

An Electrochemical Biosensor Based on the Enhanced Quasi-Reversible Redox Signal of Prussian Blue Generated by Self-Sacrificial Label of Iron Metal-Organic Framework

Lin Cui, Juan Hu, Chen-chen Li, Cheng-ming Wang, Chun-yang Zhang

PII: S0956-5663(18)30753-X
DOI: https://doi.org/10.1016/j.bios.2018.09.061
Reference: BIOS10801

To appear in: *Biosensors and Bioelectronic*

Received date: 9 July 2018
Revised date: 15 September 2018
Accepted date: 17 September 2018

Cite this article as: Lin Cui, Juan Hu, Chen-chen Li, Cheng-ming Wang and Chun-yang Zhang, An Electrochemical Biosensor Based on the Enhanced Quasi-Reversible Redox Signal of Prussian Blue Generated by Self-Sacrificial Label of Iron Metal-Organic Framework, *Biosensors and Bioelectronic,* https://doi.org/10.1016/j.bios.2018.09.061

An Electrochemical Biosensor Based on the Enhanced Quasi-Reversible Redox Signal of Prussian Blue Generated by Self-Sacrificial Label of Iron Metal-Organic Framework

Lin Cui,† Juan Hu,† Chen-chen Li,† Cheng-ming Wang, and Chun-yang Zhang*

College of Chemistry, Chemical Engineering and Materials Science, Collaborative Innovation Center of Functionalized Probes for Chemical Imaging in Universities of Shandong, Key Laboratory of Molecular and Nano Probes, Ministry of Education, Shandong Provincial Key Laboratory of Clean Production of Fine Chemicals, Shandong Normal University, Jinan 250014, PR China.

Abstract

We develop for the first time a new electrochemical biosensor for signal-on detection of T4 polynucleotide kinase (PNK) based on the enhanced quasi-reversible redox signal of prussian blue generated by self-sacrificial label of iron metal-organic framework (FeMOF). The DNA hairpin probe modified with FeMOF@AuNPs at the 3'-thiol end acts as the substrate of PNK. The presence of PNK enables the 5'-phosphorylation of hairpin probe, which may subsequently function as the substrate of lambda exonuclease. Lambda exonuclease removes the 5' mononucleotides from the stem, unfolding the hairpin structure and releasing the single-stranded DNA (ssDNA). The resultant FeMOF@AuNP-modified ssDNA may specifically hybridize with the capture probe to form the double-strand DNA (dsDNA) duplex, enabling the immobilization of FeMOF on the electrode surface. The reaction of Fe^{3+} in the MOF with $K_4Fe(CN)_6$ leads to the formation of prussian blue on the electrode surface and consequently the generation of a high electrochemical signal. This assay is very simple without the involvement of the pre-synthesized prussian