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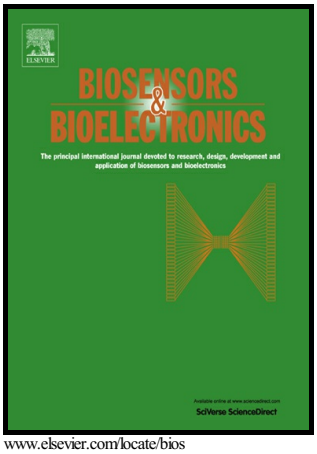

www.elsevier.com/locate/bios

PII: S0956-5663(16)30965-4
DOI: http://dx.doi.org/10.1016/j.bios.2016.09.080
Reference: BIOS9192

To appear in: *Biosensors and Bioelectronic*

Received date: 25 July 2016
Revised date: 9 September 2016
Accepted date: 23 September 2016

Cite this article as: Gangbing Zhu and Hye Jin Lee, Electrochemical sandwich type biosensors for α−1 antitrypsin with carbon nanotubes and alkalin phosphatase labeled antibody-silver nanoparticles, *Biosensors and Bioelectronic* http://dx.doi.org/10.1016/j.bios.2016.09.080

Electrochemical sandwich-type biosensors for α-1 antitrypsin with carbon nanotubes and alkaline phosphatase labeled antibody-silver nanoparticles

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Abstract

A novel sandwich-type biosensor was developed for the electrochemical detection of α-1 antitrypsin (AAT, a recognized biomarker for Alzheimer's disease). The biosensor was composed of 3, 4, 9, 10-perylene tetracarboxylic acid/carbon nanotubes (PTCA-CNTs) as a sensing platform and alkaline phosphatase-labeled AAT antibody functionalized silver nanoparticles (ALP-AAT Ab-Ag NPs) as a signal enhancer. CNTs offer high surface area and good electrical conductivity. Importantly, Ag NPs could increase the amount of ALP on the sensing surface and the ALP could dephosphorylate 4-amino phenyl phosphate (APP) enzymatically to produce electroactive species 4-aminophenol (AP). For detecting AAT based on the sandwich-type biosensor, the results show that the peak current value of AP using ALP-AAT Ab-Ag NPs as signal enhancer is much higher than that by using ALP-AAT Ab bioconjugate (without Ag NPs), the biosensor exhibited desirable performance for AAT determination with a wide linearity in the range from 0.05 to 20.0 pM and a low detection limit of 0.01 pM. Finally, the developed sensor was successfully applied to the analysis of AAT concentration in serum samples.

Keywords: Alzheimer's disease; α-1 antitrypsin; Sandwich assays; antibody functionalized silver nanoparticles; electrochemical biosensors

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