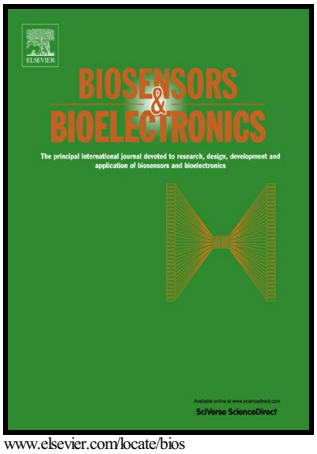
Ultrahigh sensitive enhanced-electrochemiluminescence detection of cancer biomarkers using silica NPs/graphene oxide; a comparative study

Hamid Kooshki, Jamal Rashidiani, Mehdi Kamali, Hamid Sedighian, Mostafa Akbariqomi, Mansour Mansouri



www.elsevier.com/locate/bios

PII: S0956-5663(17)30727-3
DOI: https://doi.org/10.1016/j.bios.2017.11.011
Reference: BIOS10087

To appear in: *Biosensors and Bioelectronic*

Received date: 7 August 2017
Revised date: 4 October 2017
Accepted date: 1 November 2017

Cite this article as: Hamid Kooshki, Jamal Rashidiani, Mehdi Kamali, Hamid Sedighian, Mostafa Akbariqomi and Mansour Mansouri, Ultrahigh sensitive enhanced-electrochemiluminescence detection of cancer biomarkers using silica NPs/graphene oxide; a comparative study, *Biosensors and Bioelectronic,* https://doi.org/10.1016/j.bios.2017.11.011

Ultrahigh sensitive enhanced-electrochemiluminescence detection of cancer biomarkers using silica NPs/graphene oxide; a comparative study

Hamid Kooshki[a,*], Jamal Rashidiani[a], Mehdi Kamali[a], Hamid Sedighian[b], Mostafa Akbariqomi[c], Mansour Mansouri[a]

[a] Nanobiotechnology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

[b] Applied Microbiology Research Center, Baqiyatallah University of Medical Sciences, Tehran, Iran

[c] Department of Molecular Medicine, School of Advanced Technologies in Medicine, Tehran University of Medical Sciences, Tehran, Iran

Abstract

The increasing progress in using nano-biomaterials for medical purposes has opened new horizons toward researchers around the globe. To investigate the presence of these nanomaterials and the impacts they might have, a comparative enhanced-electrochemiluminescence immunosensing study has been designed. The effects of utilizing graphene oxide, silica, and gold nanoparticles in cancer diagnosis were evaluated during the quantification of two major cancer biomarkers (CEA and AFP) in different approaches. In other words, first and second approaches were designed to employ nanomaterials while third and fourth approaches were developed in absence of those. Accordingly, resulted LODs experienced dramatic amplification when nano-biomaterials were included in the immunosensor modification (for AFP: 1st and 3rd approaches: 1.36 fg/ml in comparison with 0.39 ng/ml, and for CEA: 2nd and 4th approaches: 1.90 fg/ml versus 0.46 ng/ml, respectively). Correspondingly, capability of nano-biomaterials for developing highly sensitive and more efficient immunosensors was validated through selectivity, stability, reproducibility, and feasibility examinations.

Keywords

Silica NPs, AuNPs, graphene oxide, AFP & CEA cancer biomarkers, enhanced-electrochemiluminescence, immunosensor

* Corresponding author: Hamid Kooshki, Nanobiotechnology Research Center, Baqiyatallah University of Medical Sciences, P.O. Box 19395-5487, Tel/fax: +982182482549, Tehran, Iran; Email: hmdkooshki@gmail.com