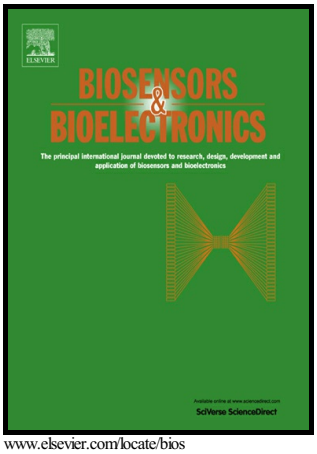
Solvent-assisted morphology confinement of a nickel sulfide nanostructure and its application for non-enzymatic glucose sensor

Soochan Kim, Sang Ha Lee, Misuk Cho, Youngkwan Lee



www.elsevier.com/locate/bios

PII: S0956-5663(16)30493-6
DOI: http://dx.doi.org/10.1016/j.bios.2016.05.062
Reference: BIOS8752

To appear in: *Biosensors and Bioelectronic*

Received date: 1 April 2016
Revised date: 11 May 2016
Accepted date: 20 May 2016

Cite this article as: Soochan Kim, Sang Ha Lee, Misuk Cho and Youngkwai Lee, Solvent-assisted morphology confinement of a nickel sulfide nanostructur and its application for non-enzymatic glucose sensor, *Biosensors an Bioelectronic,* http://dx.doi.org/10.1016/j.bios.2016.05.062

Solvent-assisted morphology confinement of a nickel sulfide nanostructure and its application for non-enzymatic glucose sensor

Soochan Kim, Sang Ha Lee, Misuk Cho, Youngkwan Lee[*]

School of Chemical Engineering, Sungkyunkwan University, Suwon 440-746, Republic of Korea

[*]Corresponding author: Tel. +82-31-290-7248. Fax: +82-31-290-7272. yklee@skku.edu

Abstract

Morphology-controlled synthesis of nickel sulfide (Ni_3S_2) was performed directly on Ni foam using thioacetamide as a sulfur ion source. Various morphologies of nickel sulfide were fabricated using a hydrothermal process by adjusting the solvent composition of ethanol and water. In the water-dominant condition, a dendrite structure was obtained; otherwise, a flaky structure was achieved. A hierarchical cauliflower-like structure was obtained at a solvent mixture composition of 1:1 and was used as non-enzymatic glucose sensor. The hierarchical Ni_3S_2 electrode showed a high level of electro-catalytic activity toward the oxidation of glucose (16,460 $\mu AmM^{-1}cm^{-2}$) over a wide range of detection (0.0005 – 3 mM) and a low detection limit (0.82 μM) with excellent selectivity in the presence of several electroactive species.

Key words: nickel sulfide, hierarchical cauliflower, solvent assist, glucose, biosensor

1. Introduction

Diabetes is one of the most serious diseases threatening human health. The diagnosis and management of diabetes mellitus require quick and accurate testing of blood glucose level (Yang et al., 2013; Shen et al., 2007; Huo et al., 2014). Conventional glucose sensors are based on the enzymatic method. These enzymatic-type sensors suffer from instable enzyme activity due to the immobilization process and storage period, which are significant