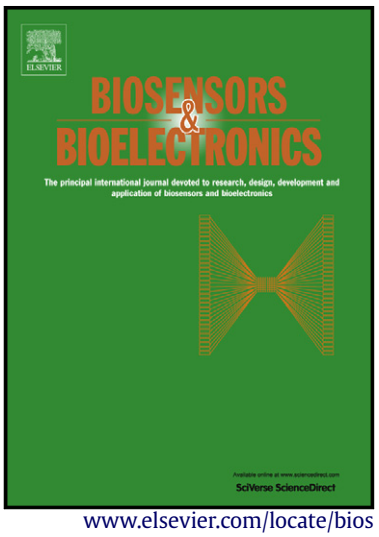

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Md. Nurul Karim, Ji Eun Lee, Hye Jin Lee

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Amperometric detection of catechol using tyrosinase modified electrodes enhanced by the layer-by-layer assembly of gold nanocubes and polyelectrolytes

Md. Nurul Karim[a], Ji Eun Lee[b] and Hye Jin Lee[a]*

[a]*Department of Chemistry and Green-Nano Materials Research Center, Kyungpook National University, 1370 Sankyuk-dong, Buk-gu, Daegu, 702-701, Republic of Korea*

[b]*Center for Theragnosis, Biomedical Research Institute, Korea Institute of Science and Technology, Hwarangno 14-gil 5, Seongbuk-gu, Seoul 136-791, Republic of Korea*

**E-mail address: hyejinlee@knu.ac.kr and Phone number: +82 (053) 950-5336*

Abstract

A novel amperometric biosensor for catechol was developed using the layer-by-layer (LbL) self-assembly of positively charged hexadecyltrimethylammonium stabilized gold nanocubes (AuNCs), negatively charged poly(sodium 4-styrenesulfonate) and tyrosinase on a screen printed carbon electrode (SPCE). A carboxylic acid terminated alkanethiol assembled on electrochemically deposited Au nanoparticles on a SPCE was used as a platform for LbL assembly. Each SPCE sensor surface was terminated with tyrosinase and the electrocatalytic response due to the tyrosinase reaction with catechol was measured using cyclic voltammetry and square wave voltammetry (SWV). The effect of introducing AuNCs into the LbL assembly to further enhance the catechol detection performance was then investigated by comparing the SWV results to those from biosensors created using both the tyrosinase modified LbL assembly in the absence of NCs and the covalent attachment of tyrosinase. A wide dynamic range from 10 nM to 80 μM of catechol with an excellent sensitivity of 13.72 A/M and a detection limit of 0.4 nM were both achieved alongside a good selectivity and reproducibility for the AuNC-modified electrodes. As a demonstration, the optimized biosensor design was applied to determine catechol concentrations in tea samples.

Keywords

Amperometric biosensor; Catechol; Gold nanocubes; Tyrosinase; Layer-by-Layer; Screen printed carbon electrode