

Preparation of Hemin-Immobilized Layer-by-Layer Films on the Surface of Glassy Carbon Electrodes as Hydrogen Peroxide Sensors

Baozhen Wang, Jun-ichi Anzai*, Weilei Gong¹,
Maoqing Wang¹ and Xiaoyan Du^{1,*}

Graduate School of Pharmaceutical Sciences, Tohoku University,
Aramaki, Aoba-ku, Sendai 980-8578, Japan

¹Public Health College, Harbin Medical University, Harbin 150081, P. R. China

(Received March 17, 2008; accepted July 14, 2008)

Key words: LbL film, hemin, hydrogen peroxide, sensor

Hemin-confined thin films composed of poly(ethyleneimine) (PEI) and carboxymethylcellulose (CMC) were fabricated by layer-by-layer (LbL) deposition on the surface of a glassy carbon (GC) electrode for the detection of hydrogen peroxide (H_2O_2). Hemin could be easily immobilized in LbL films by immersing an LbL-film-modified electrode in hemin solution, irrespective of the electric charge on the surface layer of the film. The results showed that a small amount of hemin located near the surface of the electrode is involved in the electrochemical reaction, while most of the hemin molecules in the film are not involved. The hemin-modified electrode showed an excellent amperometric response to H_2O_2 on the basis of electrocatalytic reduction under electrode potentials of -0.6 and -0.4 V. The hemin-modified electrode exhibited a linear calibration graph for 0.005 – 0.8 mM H_2O_2 when operated at -0.6 V. The hemin-modified electrode was found to be stable for about 2 weeks. Thus, the usefulness of LbL films composed of PEI and CMC as a scaffold for immobilizing hemin was demonstrated.

*Corresponding author: e-mail: junanzai@mail.pharm.tohoku.ac.jp, duxiaoyanha@163.com