Selective immobilization of biomolecules on a heat-sensitive polymer-modified surface

Hyoung Gil Choi, Jun Hwang Lee, Seung Yeon Song, Seung Yeol Park,
Jung Woo Hong, and Hyun C. Yoon*
Department of Biotechnology, Ajou University
TEL: +82-31-219-2512, FAX: +82-31-219-2394, E-mail: hcyoon@ajou.ac.kr

To provide the heat-sensitivity to the electrode surface, poly(N-isopropylacrylamide) (PNIPAAm) was synthesized and used as the interface of electrocatalytic sensors. In an aqueous solution, PNIPAAm shows highly reversible hydrophilic/hydrophobic changes of its conformation in response to its lower critical solution temperature (LCST). For the absorption of glucose oxidase (GOX) and bioelectrocatalysis, poly(amidoamine) dendrimer SAM was formed on the electrode interface[1]. N-hydroxysuccinimide(NHS)-esterified PNIPAAm was synthesized for binding to the amine-functionalized surface[2]. After the modification of electrodes, the GOX adsorption reaction was conducted on the PNIPAAm modified dendrimer monolayer. Then, the surfaces were manipulated based on the structural transition of PNIPAAm by changing the environmental temperature across LCST. The efficiency of the immobilization of enzyme on surfaces with hydrophilic or hydrophobic property was evaluated from the bioelectrocatalytic sensor signal. The results from electrochemical tests indicated that the extended form of PNIPAAm on the surface inhibited the approach of GOX on the interface. Therefore, the selective attachment of enzymes on the electrode surface can be controlled by simply changing the working temperature.

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References

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