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Kento Sakai, Hong-qi Xia, Yuki Kitazumi, Osamu Shirai, Kenji Kano

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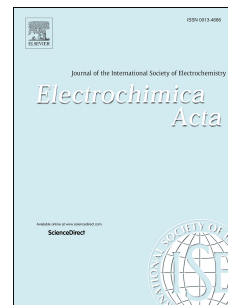
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## Assembly of Direct-Electron-Transfer-Type Bioelectrodes with High Performance

Kento Sakai, Hong-qi Xia, Yuki Kitazumi, Osamu Shirai, Kenji Kano\*

*Division of Applied Life Sciences, Graduate School of Agriculture, Kyoto University, Sakyo, Kyoto 606-8502, Japan*

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\* Corresponding author. Tel.: +81 75 753 6392; fax: +81 75 753 6456.

*E-mail address:* kano.kenji.5z@kyoto-u.ac.jp (K. Kano)

### Abstract

Direct electron transfer bioelectrocatalysis is an essential type of reaction for the development of bioelectrochemical devices such as biosensors, biofuel cells, and bioreactors. In this work, we performed several modifications of mesoporous electrodes to improve the heterogeneous electron transfer kinetics and the orientation of three different enzymes: bilirubin oxidase from *Myrothecium verrucaria*, hydrogenase from *Desulfovibrio vulgaris* Miyazaki F, and tungsten-containing formate dehydrogenase from *Methylobacterium extorquens* AM1. The results are discussed based on the curvature effects of mesoporous structures, the edge effect of the diffuse double layer around microporous structures, and the electrostatic interactions between enzymes and electrodes.

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