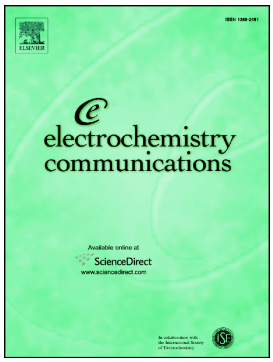

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Magnetic-field-induced orientation of fructose dehydrogenase on iron oxide nanoparticles for enhanced direct electron transfer

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Abstract

We present electrochemical evidence that magnetic interactions between the paramagnetic heme centers of fructose dehydrogenase subunit II and superparamagnetic iron oxide nanoparticles enable a suitable orientation of the enzyme molecule and enhance the rate of direct electron transfer. This enhancement of the rate of DET resulting from the appropriate orientation was examined with differential pulse voltammetry. The closer approach of the heme sites to the electrode results in a decreased fructose oxidation overpotential, a smaller Michaelis–Menten constant and an overall improvement in electrode performance in the presence of an external magnetic field.

Keywords: bioelectrocatalysis, iron oxide nanoparticles, fructose dehydrogenase, magnetic field, direct electron transfer

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