Abstract

Genetic Engineering of Enzymes and Electrode Modifications for Biosensing Applications [†]

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Biosensing efficiency, selectivity and sensitivity rely first and foremost on a successful interfacing between enzymes and sensing interfaces. An interface that allows, on the one hand, a specific analyte recognition and, on the other hand, an efficient signal transduction. Some of the challenges in biosensing stem from the incorrect orientation of the enzyme towards the sensing interface and from the need to use mediated electron transfer with a diffusional redox mediator due to difficulty in relaying a signal from a redox center that is deeply buried inside the protein matrix. Using genetic-code expansion tools, and genetic engineering approaches, we were able to modify redox enzymes and surfaces for biosensing and biofuel cell applications so they could have superior properties over native enzymes. In my talk, I will demonstrate how site-specific wiring of redox enzymes, which are genetically encoded, can improve electron transfer due to controlled and short electron transfer distances and due to proper enzyme orientation. I will also demonstrate how rational genetic engineering of an enzyme gives it superior properties for biosensing purposes compared to those of the native enzyme.

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