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Microbial surface displaying enzymes for biosensors and biofuel cell applications

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Microbial surface display is a biotechnology that protein, polypeptide or antibody could be expressed on the surface of phage, bacteria, yeast and other microorganisms. This approach could find potential applications in biocatalysis, environmental governance and bioanalysis. In this talk, the display of dehydrogenases and glucose oxidase on the surface of E. coli or yeast for the construction of whole-cell biocatalysts are demonstrated. The electrochemical biosensing of xylose and glucose applications by using the microbial surface displaying enzymes are highlighted. Then, a novel approach for assembly of enzymatic biofuel cell (BFC) will be exhibited, which can directly convert energy from xylose using xylose dehydrogenase surface displayed bacteria. The strategy overcomes the conventional limitations such as the undesirable long-term durability and electron transfer issue in the development of BFCs. Therefore, by use of genetic manipulation means, the bacterial whole-cell can be engineered for sensing, and as more efficient and cost-effective alternatives to traditional analytical techniques.

Biography

Aihua Liu is Professor and group leader of the Laboratory of Biosensing, Qingdao Institute of Bioenergy & Bioprocess, Chinese Academy of Sciences (CAS). His research interests cover 1) Nano-bio self-assembly, 2) Microbial surface display, and 3) Bisensors and biofuel cells. He received his PhD in Pharmaceutical Physico-chemistry from Tohoku University, Japan (2004) with major in bioelectrochemistry and biosensing based on functional self-assembled membrane. Following that he worked in the National Institute of Advanced Industrial Science & Technology (AIST), Japan under the Japanese Society for the Promotion of Sciences (JSPS) fellowship (2004-2006). After that he moved to the US and conducted his Postdoc research in Michigan State University (2006-2007), University of Oklahoma (2007-2009), and University of Texas at Arlington (2009-2010). In 2010 he was awarded CAS Hundred-Talent Program and joined Qingdao Institute of Bioenergy & Bioprocess, CAS as Full Professor. From 2009 on, he is the managing editor to Frontiers in Bioscience. He has published over 40 peer-reviewed papers in leading journals including *Angewandte Chemie International Edition, Advanced Materials, Analytical Chemistry* and *Biosensors & Bioelectronics*. His papers have been cited over 1000 times by others. He gave over 20 invited lectures at international conferences around the world.

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