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Nucleic acid biosensors and electrochemical biosensors for food safety analysis

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Food safety has been an increasing public concern worldwide, and rapid detection technologies for contaminants in food and agricultural products are of crucial importance to food safety. In the past few decades, various instruments based on optics, electrochemistry and acoustics et al. have been exploited for food analysis. Despite much progress has been made, many of them are either too expensive, or inconvenient, or inaccurate, or too complicated for operation. Herein, there has been an increasing demand for developing highly efficient, reliable, and cost-effective instruments for rapid and on-line analysis. With this regard, considering simple fabrication, disposability and portability of Screen-Printed Carbon Electrodes (SPCEs), we have developed a series of detection methods based electrochemistry. First, a portable electrochemical device capable of identifying and detecting heavy metals has been developed. With the square wave pulse anodic stripping voltammetry, this instrument can successfully achieve highly sensitive detection of seven different heavy metals (including copper, lead, zinc, cadmium, chromium, mercury and arsenic) in a variety of food including grains, vegetables and fish. Secondly, pesticide residue analysis in fruit and vegetables have been developed based on Acetylcholinesterase (AChE) enzyme modified SPCE. Other work such as detection of illegal additives, animal drug residues and pathogens are also being investigated. It is evident that SPCE based electrochemical instruments would play a very important role in food safety analysis and environmental monitoring.

Recent Publications

1. Huizhen Zheng, Ronglin Ma, Meng Gao, Xin Tian, Yong-Qiang Li, Lingwen Zeng and Ruibin Li (2018) Antibacterial applications of graphene oxides: structure-activity relationships, molecular initiating events and biosafety. Science Bulletin 2(63):133-142.

2. Jin Zhao, Haixiong Xia, Tingyu Yu, Lu Jin, Xuehua Li, Yinghui Zhang, Liping Shu, Lingwen Zeng and Zhixu He (2018) A colorimetric assay for vanillin detection by determination of the luminescence of o-toluidine condensates. PLoS One 13.

3. Zeng Y, Wang L, Zeng L, Shen A and Hu J (2017) A label-free SERS probe for highly sensitive detection of Hg2+ based on functionalized Au@Ag nanoparticles. Talanta 162: 374-379.

4. Wang L, Zeng Y, Shen A, Fu Y, Zeng L and Hu J (2016) Facile and controllable synthesis of triplex Au@Ag–Pt@infinite coordination polymer core–shell nanoparticles for highly efficient immobilization of enzymes and enhanced electrochemical biosensing activity. RSC Adv 6(89):86025-86033.

5. Lu X, Liang X, Dong J, Fang Z, Zeng L (2016) Lateral flow biosensor for multiplex detection of nitrofuran metabolites based on functionalized magnetic beads. Anal. Bio. Chem 408(24): 6703-6709.

Biography

Lingwen Zeng has obtained his PhD degree in Genetics at McMaster University, Canada in 1993 and his postdoctoral training at The University of Chicago, USA. He worked in three publicly traded companies (Quest Diagnostics Inc, Scios Inc and Genetics Computer Group Inc) in USA as a Research Scientist and a Project Manager. Currently, he serves as a Principle Investigator at Guangzhou Institutes of Biomedicine and Health, Chinese Academy of Sciences, and Director at the Institute of Environment and Safety, Wuhan Academy of Agricultural Sciences. His research focuses on exploring novel molecular diagnostic technologies for human diseases, food and environmental safety.

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