

Development of optical biosensors for rapid detection of toxic contaminants from different environmental media

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Environmentally toxic chemicals such as organophosphorus pesticides (OPP) and heavy metals have been widely used in the environment. Due to their highly toxic effect on organisms, the potential risk of these toxic chemicals to human health and ecology has received much attention. Several techniques such as chromatography, mass spectrometry, capillary electrophoresis, microdialysis and biosensors have been developed to detect environmental contaminants in a range of complex matrices. Of various techniques developed, biosensors are one of the most rapidly growing techniques developed for rapid detection of pesticides and heavy metals. In particular, optical biosensors are simple to fabricate, easy to use, and suitable for on-site detection. In this study, several optical biosensors including sol-gel based and core-shell type biosensors have been developed for detection of environmental contaminants in the different media. The combination of acetylcholinesterase (AChE) and microfluidic devices has been developed for rapid and sensitive detection of organophosphorus pesticides from vegetables. The residual concentrations of pesticides could be obtained within 10 min and the limits of detection were 0.5 mg/L for carbofuran and 0.025 mg/L for chlorpyrifos, which is comparable with the Rapid Bioassay for Pesticide Residues method. The Au@SiO₂ biosensing system was developed for rapid and sensitive detection of metal ions from aqueous solution. The limit detections of Cd and Ni were in the range 15-50 mg/L. In addition, the optical biosensor showed a relatively high storage stability over more than 1 month. Results obtained in this study clearly demonstrate that optical biosensor is a simple but efficient method, which can be used as the platform for detection of environmentally toxic chemicals in water and solid samples.

Biography

Ruey-an Doong has received his Ph.D in Environmental Engineering at National Taiwan University, Taiwan in 1992. Currently, he is working as full professor and Dean of College of Nuclear Science, National Tsing Hua University, Taiwan. He is serving as an editorial member of several reputed journals like Journal of Environmental Engineering and Management and Global Journal of Environmental Science and Technology. He has authored more than 100 research articles/books. In addition, he has honored as fellow of Alexander von Humboldt Foundation, Germany.

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