

High-Sensitivity Detection for Paraoxon with QCM Sensor Based on the Dimeric Precipitation of Enzymatic Reaction Product

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A quartz crystal microbalance(QCM) sensor for detecting organophosphorus pesticide paraoxon was developed. The operating principle of this biosensor is precipitation of the dimer of 3-hydroxyindole which is produced by the degradation of a histological substrate, 3-indolyl acetate, with cholinesterase(ChE). As paraoxon inhibits ChE activity, the sensor responses decreased at increasing paraoxon concentrations. To immobilize ChE onto the gold electrode of QCM surface, 3 immobilization protocols including chemisorption of the thiolated ChE, carboxyl-amine coupling of the enzyme to 3-mercaptopropionic acid self-assembled monolayer(SAM) and glutaraldehyde cross-linking to cystamine SAM. The biosensor system was optimized with respect to the surfactant concentration in the reaction buffer, 0.1 M potassium phosphate(pH 8.0), the enzyme amount for immobilization and substrate concentration. The susceptibility of the ChE-based inhibition sensor of this study to an organophosphorus pesticide paraoxon was determined at the optimized analytical conditions, which showed the efficiency of this biosensor as a screening tool for paraoxon.

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References

1. N. G. Karousos, S. Aouabdi, A. S. Way and S. M. Reddy, Quartz crystal microbalance determination of organophosphorus and carbamate pesticides(2002), *Anal. Chim. Acta*, **469**, 189-196.
2. M. S. Blake, K. H. Johnston, G. J. Russell-Jones and E. C. Gotschlich, A rapid, sensitive method for detection of alkaline phosphatase-conjugated anti-antibody on Western blots(1984), *Anal. Biochem.*, **136**, 175-179.
3. I.-S. Park and N. Kim, Thiolated *Salmonella* antibody immobilization onto the gold surface of piezoelectric quartz crystal(1998), *Biosens. Bioelectron.*, **13**, 1091-1097.