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Title:Highly sensitive detection of organophosphorus pesticides by acetylcholinesterase-coated thin film bulk acoustic resonator mass-loading sensor
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Abstract:An acetylcholinesterase-coated thin film bulk acoustic resonator has been developed for the detection of organophosphorus pesticides. The thin film bulk acoustic resonator acts as a robust mass-sensitive transducer for bio-sensing. This device works in thickness shear mode with a resonance at 1.97GHz. The detection is based on the inhibitory effects of organophosphorus compounds on the enzymatic activity of the acetylcholinesterase immobilized on one of the faces of the acoustic resonator. The enzyme reaction in the substrate solution and the inhibitory effect is observed are real time by measuring the frequency shift. The presence of organophosphorus pesticides can be detected from the diminution of the frequency shift compared with the levels found in their absence. The device exhibits linear responses, good reproducibility, simple operation, portability and a low detection limit of 5.3×10⁻¹¹M for paraoxon. The detection results of organophosphorus pesticide residues in practical samples show that the proposed sensor has the feasibility and sensing accuracy comparable to gas chromatography. © 2012 Elsevier B.V.
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Uncontrolled terms:Acetylcholinesterase - Biosensing - Enzymatic activities - Enzyme reaction - Frequency shift - Inhibitory effect - Linear response - Low detection limit - Organophosphorus compounds - Organophosphorus pesticide - Paraoxon - Pesticide residue - Real time - Reproducibilities - Sensing accuracy - Sensitive detection - Simple operation - Substrate solution -

Thickness shear modes - Thin film bulk acoustic resonator

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