

# Electrochemical Determination of Malathion on an Acetylcholinesterase-Modified Glassy Carbon Electrode

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## Abstract

© 2017 Taylor & Francis. An acetylcholinesterase biosensor based on glassy carbon electrode modified with carbon black and pillar[5]arene was used for the determination of malathion after its preliminary oxidation. The contributions of enzyme immobilization and oxidation conditions to the improvement of analytical characteristics of the biosensor were considered and quantified. In optimal conditions, the acetylcholinesterase biosensor allows the determination of 40 pM of malathion with 10 min of incubation and 15 pM with 30 min of incubation. The sensitivity of immobilized enzyme was found to be higher than that the free enzyme due to sorptional accumulation in the modifier layer. Incomplete oxidation of malathion decreased the sensitivity of the assay. The developed acetylcholinesterase biosensor was validated for the determination of malathion residues in grapes, wine, and peanuts. The recoveries calculated against a high-performance liquid chromatography assay were between 80 and 120% due to possible matrix effects and the simplified extraction protocols.

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## Keywords

Acetylcholinesterase biosensor, inhibition measurement, irreversible inhibition, malathion determination

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