# Analysis of Accelerants by Gas Chromatography-Mass Spectrometry and Cyclic Voltammetry for Biosensor Development

by

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# CERTIFICATE

I certify that the work in this thesis has not been previously submitted for a degree nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature are included in the thesis.

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# ABSTRACT

This project encompasses a detailed literature review of a variety of topics, covering fire scene examination, accelerants and present accelerant detection techniques, biosensors, the human olfactory system and electrochemical analytical techniques such as cyclic voltammetry. An overview of all these areas allows a theory to be brought together, that a biosensor could be created for the presumptive detection of accelerants at fire scenes, a sensor with a high degree of discrimination power achieved through the selectivity of specific biological agents and computerised pattern recognition fabricated into an array. As a result of the large area covered by the literature review, this project's experimental component explored the use of cyclic voltammetry as a tool to investigate the electroactive behaviour of accelerants and their extracts. Optimisation of conditions including pH, electrode type, and extraction time were also completed. The results of the research showed that no electroactive species were present in the accelerants within the detection limit of the method used. This result is important given that the future direction of this project includes the layering of an olfactory receptor onto an electrode to create a biosensor. This can be accomplished with the assurance that there will be no interference from electrode/accelerant interactions. Accelerant standards were also analysed using Gas Chromatography – Mass Spectrometry and confirmed using current fire debris sample analysis standards.