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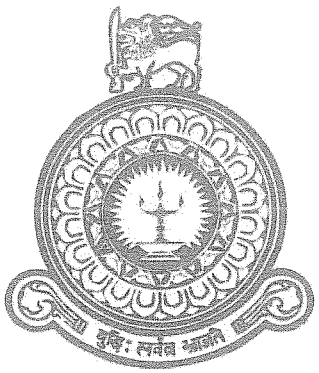

# THE SYNTHESIS OF METAL OXIDE NANO MATERIALS TO INVESTIGATE THE REACTIVITY OF NANO MATERIAL WITH ORGANOPHOSPHORUS COMPOUNDS

A thesis submitted to the Faculty of Science,
University of Colombo,
In partial fulfillment of the degree of
M.Sc. in Analytical Chemistry

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December 2014

## ACKNOWLEDGEMENTS

First and foremost I would like to express my deepest gratitude to my supervisors prof. (Mr) K. M. N. de Silva, Professor, Department of Chemistry, University of Colombo and Dr. (Mrs) Rohini M. de Silva, senior lecturer, Department of Chemistry, University of Colombo to whom I am mostly grateful for their supervision and instruction at all times that led to the successful completion of my research project and thesis.

Furthermore, I would like to thank Dr. C. Dilrukshi Wijayarathna, the co-ordinator of the MSc. In Analytical Chemistry program and all the other lectures of the Department of Chemistry at the University of Colombo for their invaluable assistance and guidance provided.

I am thankful to all the members of the CARD Lab, at the University of Colombo, especially Mr. Keerthi Ariasena, the Laboratory technician, for his fullest support whenever his services were required.

I am greatly indebted to my family, who were behind me in every step of my education, supporting me, funding me up to me to develop me up to what I am now today.

Finally I would like to express my grateful thanks to my husband, Narada Wickramasinghe who was helped me in numerous ways and all my friends who guided me whenever I needed, advised and helped by expending their valuable time.

# ABSTRACT

Organophosphorus compounds exhibit a wide range of toxicity to mammals. They affect the central nervous system inhibiting its normal function resulting in convulsions, paralysis and death. Metal oxides demonstrate a superior ability to adsorb and decompose organophosphorus compounds.

High surface area powders have been found to offer superior adsorption capabilities and nanomaterials show enhanced reactivity due to a higher degree of defect sites.

In this research work, three metal oxide nanoparticles namely, CaO, ZnO, and $Fe_3O_4$ were synthesized using simple and low cost methods. The characterization of synthesized particles was carried out by using FTIR, SEM, and XRD methods.

The destruction abilities of the synthesized metal oxides were investigated by reacting the prepared nanoparticles with malathion. The presence of malathion in the samples was investigated by measuring absorbance at the $\lambda_{max}$ of 220 nm and 6 hours was chosen as the optimum contact time for all these nanoparticles.

Destruction ability of synthesized nanoparticles towards malathion was investigated using different weight ratios of metal oxide, keeping malathion amount constant. In this experiment it was found that the destruction of malathion on nanoparticles, ZnO, and $Fe_3O_4$ has increased with increasing the ratio of malathion to metal oxide. However CaO behaved differently and did not exhibit a significant increment in reactivity with increasing the weight. Also CaO nanoparticles showed the highest reaction ability with malathion at the 1:1 weight ratio. ZnO nanoparticles showed the highest destruction ability both CaO and ZnO showed nearly equal performance towards malathion. Finally the reactivity of malathion with conventional micro size metal oxides was investigated and the synthesized CaO, and ZnO nanoparticles were compared with conventional metal oxide particles.

It was found that the destruction efficiency values of the conventional micron size metal oxides, CaO, and ZnO at the 1:32 weight ratio were 46%, and 36% respectively. For the synthesized nano CaO, and ZnO these values were 62%, and 67%. Therefore, it can be concluded that the synthesized nanoparticles are more reactive towards the organophosphorus compound than for the conventional micron size metal oxide.