ELECTROCHEMICAL CATALYTIC DEHALOGENATION OF ORGANOHALIDE POLLUTANTS.

BY

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DECLARATION

I Miriam masila hereby declare that this thesis is my original work and has not been presented for a degree in any other university.

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Date 7/6/96.

This thesis has been submitted with our approval as university supervisors.

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ABSTRACT

Linear Potential Sweep Voltammetry by PAR 174A Polarographic Analyzer at a glassy carbon electrode disk (Area=0.071 cm^2) working electrode and a platinum wire counter electrode was used to study the electrochemical behaviour of the Catalyst, Copper Phthalocyanine tetrasulfonate (CuPcTS), in both 0.1 M tetrabutylammonium tetrafluoroborate ($TBABF_4$) acetonitrile/water (1:1) and Didodecyldimethylammonium bromide (DDAB/Dodecane/water (23%:34%:43%) microemulsion. The effects of the catalyst on the dehalogenation of organohalide substrates such as trichloroacetic acid (TCAA) was also studied.

Voltammograms obtained for CuPcTS alone revealed the presence of two diffusion-controlled reduction peak potentials at -0.65 V and -1.428 V vs. the saturated calomel electrode (SCE) in the 0.0 to -1.75 V vs. SCE potential range. Occurrence of adsorption prepeaks (at less negative potential) on each side of the two diffusion peaks indicated strong adsorption of the products of reduction at the electrode. Addition of 10-fold molar excess trichloroacetic acid (TCAA) resulted in an increase in the limiting current of the second reduction potential, indicating a catalytic effect on the decomposition of TCAA. Solvent extraction using diethyl ether and HPLC (acetonitrile/water, 70:30) analysis of the electrolysed mixtures showed destruction of TCAA to acetic acid (AA), Monochloroacetic acid (MCAA) and dichloroacetic acid (DCAA).

The stability of CuPcTS solution with change in time was investigated using UV-Vis spectroscopy. The constant values of λ_{max}