General Disclaimer

One or more of the Following Statements may affect this Document

- This document has been reproduced from the best copy furnished by the organizational source. It is being released in the interest of making available as much information as possible.

- This document may contain data, which exceeds the sheet parameters. It was furnished in this condition by the organizational source and is the best copy available.

- This document may contain tone-on-tone or color graphs, charts and/or pictures, which have been reproduced in black and white.

- This document is paginated as submitted by the original source.

- Portions of this document are not fully legible due to the historical nature of some of the material. However, it is the best reproduction available from the original submission.

Produced by the NASA Center for Aerospace Information (CASI)
STUDIES IN ELECTRON PHENOMENA IN MOS STRUCTURES

- THE PULSED C-V METHOD

by

G. KAPLAN

STUDIES IN ELECTRON PHENOMENA IN MOS STRUCTURES: THE PULSED C-V METHOD M.S.
Thesis. Abstract Only (New South Wales Univ.) 2 p. HC 102/FF A01

M85-26467

THESIS FOR THE DEGREE OF

MASTER OF ENGINEERING

IN THE

SCHOOL OF ELECTRICAL ENGINEERING

UNIVERSITY OF NEW SOUTH WALES

RECEIVED BY
NASA STI FACILITY
DATE: 5-15-83
DCAF NO. 009172

PROCESSED BY
☑ NASA STI FACILITY
☐ ESA-SDS ☐ AIAA

1983
SUMMARY

C-V methods for the investigation of electron phenomena in MOS structures have shown great advances as the theory of the semiconductor-oxide interface developed.

From 1962 to about 1975 attention was concentrated on quasiequilibrium C-V methods, i.e. the H-F C-V method and the LF C-V method. The pulse C-V method was used mainly for the investigation of the transients in MOS capacitance caused by minority charge carriers. The most noticeable attempt to use the pulse technique for the surface state measurements was made by Muller and Shick in 1970.

Recently, owing to the development of the theory of MOS structures and experimental techniques, the C-V method has been further developed. For example, deep level pulse spectroscopy and also the pulse hysteresis C-V method originated by the author of this work. The latter is presented and developed in this thesis. The pulse hysteresis C-V method provides a straightforward technique for measuring the change of various charges in MOS structures and a tool for investigating the kinetics of various electron phenomena. For example, the pulse hysteresis C-V method can be used for measuring the energy distribution and kinetics of surface states with the resolution of about $5 \times 10^{-9} \text{cm eV}^{-1}$.

A theoretical investigation is also presented of some transients in an MOS structure, particularly, the thermal generation of minority charge carriers via surface states and the relaxation of minority charge carriers supplied from the inversion layer outside the MOS structure. This investigation resulted in derivation of the analytical expressions which clearly present the physics of those electron phenomena.