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Role of Interfaces in Determining the Electrical Properties of Metal–Oxide–Metal Structures

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Metal–oxide interfaces, especially when the oxide may be amorphous, are of increasing technological and scientific interest. The oxide in M–O–M structures may be fabricated such that it is amorphous or, at best, polycrystalline. Thus, such structures are excellent for studying oxide interfaces.

Since it is very possible that there are states in the oxide gap, space charge may exist at the metal–oxide interfaces. If the direct current and alternating current properties of these sandwich structures are examined they may be used to obtain information concerning transport in the oxide, the interface structure, and trap configurations. In this presentation, the correlation between dc and ac properties will be examined. An ac equivalent circuit model, *derived* assuming that the principal polarization mechanism is that of growth or decay of these interface space charge regions, will be presented.

Numerical evaluation of the ac and dc electrical characteristics, based on this analysis will be presented using various models for the interface and bulk transport processes as well as various models for the configuration of the localized states in the gap.

These analytical and numerical results will be used to interpret experimental data obtained for several M–O–M systems. On the basis of this approach, conclusions may be reached regarding the oxide interface thickness, trap configuration, and development with bias. Conclusions may also be reached regarding the relative magnitudes of the interface and interior electric fields.