

Nonlinearity of capacitors

Do metal-insulator-metal capacitors based on high-k oxides have a nonlinear behavior?

Metal-Insulator-Metal (MIM) capacitors based on high-k oxides require stability with the applied electric field. However, experiment reveals a nonlinear behavior of capacitance with ac or dc bias. In this work, we measure capacitance-voltage nonlinearities for Au/10-nm HfO₂/M (where M = TiN, Pt, W, and AlCu alloys).

What causes DC nonlinearity in metal insulator-metal capacitors?

For the dc bias, oxygen affinity of active metal electrode may describe the origin of dc nonlinearities. Increasing functionalities and performances of systems based on metal-insulator-metal capacitors require the search of a suitable candidate allowing high capacitance density as well as low leakage current [1,2].

Is AC capacitance a nonlinear behavior?

However, experiment reveals a nonlinear behavior of capacitance with ac or dc bias. In this work, we measure capacitance-voltage nonlinearities for Au/10-nm HfO₂/M (where M = TiN, Pt, W, and AlCu alloys). It is observed that ac capacitance is strongly dependent on the bottom electrode material.

Are MIM capacitors based on high-k oxides nonlinear?

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When a capacitor is subjected to a DC field a nonlinearity is observed?

Generally, when a capacitor is subjected to a dc field, nonlinearities are observed in the capacitance-voltage variation which are commonly described as [3,4] $\frac{\Delta C}{C_0} = \alpha V^2 + \beta V$,

What causes DC nonlinearity in MIM capacitors based on hafnium oxide?

Several models have been proposed to point out this issue for dc nonlinearity in MIM capacitors based on Hafnium oxide [3,5,10]. And the observed nonlinearity is linked to electronic defect by means of the heat of formation of metal oxide or to the electrode work function .

The nonlinearity is the maximum deviation from the dashed line. This is called endpoint nonlinearity, which is defined in the work of Nyce et al. . With a displacement in the ...

Metal-insulator-metal capacitors using high-k oxides are known to display nonlinear capacitance-voltage (C-V) characteristics. In the present work it is proposed that ...

A case study on film capacitors proved that the new reliability assessment method can provide a more accurate and reasonable result than that under single PC and ...

Nonlinearity of capacitors

A voltage-variable capacitor is an essential part of the matching element in radio frequency (RF) circuits, including the transmitting and receiving channel of mobile devices. ...

the "space-charge" capacitor whose voltage dependence is of the form $C_v = C_0 \sinh(aV/V_0)$, where V , is the potential across the capacitor. The variation of the differential capacitance of ...

The RF tunable devices used in mobile phones are either continuously or digitally tunable capacitors, which are tuned by means of imposed voltage, as described in Chap. ...

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This paper presents a modelling technique for major limitations, i.e. capacitor mismatch and non-linearity effects. The model is based on Monte Carlo simulations applied to ...

It was shown that the measuring of capacitor V/A characteristic nonlinearity is usable and effective tool for monitoring of capacitor quality. Six capacitors of this type were ...

The difference between compositional and grain size effect on the dielectric nonlinearity was contrasted in Mn and V-doped BaTiO₃ multilayer ceramic capacitors utilizing ...

Voltage nonlinearity is a crucial performance parameter of MIM capacitors for RF, analog and mixed signal IC applications. In present work, the fabrication and characterization ...

Metal-insulator-metal capacitors using high-k oxides are known to display nonlinear capacitance-voltage (C-V) characteristics. In the present work it is proposed that such nonlinearities arise ...

The resulting models are intended for use in time-domain circuit simulators to assess the effects of material nonlinearity on the electrical performance of such components as discrete de ...

For embedded high resolution successive approximation ADCs, it is necessary to determine the performance limitation of the CMOS process used for the design. This paper ...

Voltage nonlinearity is studied in microelectronic metal / insulator (oxide) / metal capacitors. The influence of electrodes (work function, oxygen affinity) and test parameters (dc or ac bias, ...

In this article, we investigate the effect of MOS capacitance nonlinearity on the overall performance of discrete-time sigma-delta modulators. To this end, a behavioral-level ...

The nonlinearity of a commercial antiferroelectric (AFE) multilayer ceramic capacitor (MLCC) was investigated via hysteresis loop and DC bias characteristics. Capacitors ...

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