Non-ferroelectric capacitors

Are ferroelectric negative capacitance electronics practical?
While significant progress has been made in the basic understanding of ferroelectric negative capacitance in recent years,the development of practical devices has seen limited successso far. Here,we present a unique view of the field of negative capacitance electronics from the ferroelectric materials perspective.

How does a ferroelectric polarization effect a capacitor?
This effect is achieved by connecting a ferroelectric material in parallel with a regular capacitor. When a voltage is applied across the ferroelectric material,its polarization opposes the voltage resulting in a net decrease in the voltageacross the combination of the ferroelectric and regular capacitors.

What is the energy landscape of a ferroelectric capacitor?
a Energy landscape U of a ferroelectric capacitor when no voltage is applied. The capacitance C appears negative when QF = 0. b, c Evolution of the energy landscape when the voltage is applied across the ferroelectric capacitor that is smaller (b) or greater (c) than the coercive voltage V c.

What contributes to the permittivity of a ferroelectric capacitor?
The permittivity of a ferroelectric capacitor is contributed by both the lattice (intrinsic component) and the vibration of domain walls (DW) under a small AC electric field (extrinsic component). 13,14,26 The cross-point for the forward and reverse sweep of a symmetric C-V in a perfect ferroelectric capacitor should be at zero DC voltage.

How to stabilize negative capacitance in ferroelectric materials?
In summary,stabilizing negative capacitance requires a combination of material engineering,device design,and control strategiesto overcome the instabilities so that the desired behavior in ferroelectric materials can be maintained.

Does a ferroelectric polymer have a negative capacitance effect?
Lee et al. (2018) investigated the negative capacitance effect in organic ferroelectric polymers. They demonstrated that by incorporating a ferroelectric polymer layer such as poly (vinylidene fluoride-co-trifluoroethylene) (PVDF-TrFE) into the gate stack of an organic field-effect transistor (OFET),negative capacitance was observed.

Tunable, non-volatile, small-signal capacitance is observed and characterized in a TiN/ferroelectric Hf0.5Zr0.5O2 (HZO)/TiN stack. The non-volatility of the small-signal capacitance originates ...

These nonvolatile storage elements, such as ferroelectric random access memory (FeRAM), ferroelectric field-effect transistors (FeFETs), and ferroelectric tunnel ...

Non-ferroelectric capacitors

In this brief, we first introduce the device properties of the non-volatile capacitor and their underlying physical mechanism. Moving to array-level analysis, we obtain the optimal ratios ...

Tunable, non-volatile, small-signal capacitance is observed and characterized in a TiN/ferroelectric Hf 0.5 Zr 0.5 O 2 (HZO)/TiN stack. The non-volatility of the small-signal capacitance originates from the non-uniform ...

DOI: 10.1109/LED.2023.3278599 Corpus ID: 258856731; Capacitive Memory Window With Non-Destructive Read in Ferroelectric Capacitors @article{Mukherjee2023CapacitiveMW, title={Capacitive Memory Window With Non-Destructive Read in Ferroelectric Capacitors}, author={Sayan Mukherjee and Jasper Bizindavyi and Sergiu Clima and Mihaela Ioana ...

Starting from the basic principles of ferroelectric negative capacitance, we discuss the desirable characteristics of a negative capacitance material, concluding that HfO 2-based ferroelectrics are currently most promising for applications in electronics.

Although Hf-Zr-based ferroelectric capacitors are fabricated with other electrodes, the focus is predominantly directed toward obtaining a large ferroelectric response. The impact of the electrodes on data retention for these ferroelectrics remains underreported and greater insight is needed to improve device reliability. Here, a comprehensive set of electrodes ...

In this work, we demonstrate a record high non-volatile capacitive MW and non-destructive read in hafnium zirconate-based metal-ferroelectric-metal capacitors (FeCAPs).

Ferroelectric RAM is considered a promising candidate on the quest for a universal memory, but the concept is still problem prone. Here, the authors use the ferroelectric photovoltaic effect as a ...

and interesting properties such as high permittivity capacitors, ferroelectric non-volatile FeRAM memories, pyroelectric sensors, piezoelectric and transducers, electrooptic and optoelectronic devices, etc. Keywords: dielectrics, ferroelectrics, polarization, piezoelectric, pyroelectric, hysteresis loop, phase transitions 1. Introduction The investigations of dielectrics, ferroelectrics ...

These nonvolatile storage elements, such as ferroelectric random access memory (FeRAM), ferroelectric field-effect transistors (FeFETs), and ferroelectric tunnel junctions (FTJs), possess different data access mechanisms, individual merits, and specific application boundaries in next-generation memories or even beyond von Neumann ...

While time-dependent imprint can be associated with the charge injection at the electrode-ferroelectric interface layer and/or the redistribution of oxygen vacancies within the ferroelectric, the root cause of fluid imprint is mainly related to the charge injection into and migration across the (non-ferroelectric) interfacial layer.

Non-ferroelectric capacitors

Here, the authors propose a two-terminal ferroelectric fin diode non-volatile memory in which a ferroelectric capacitor and a fin-like semiconductor channel are combined ...

Single domain nanoparticles are not ferroelectric, but they can be capacitive in the high-frequency region due to the absence of ferroelectric losses. Embedding non-ferroelectric BZN or giant dielectric constant perovskite oxide (BST) nanoparticles in a polymer matrix might be another promising route to achieve low-loss capacitive behavior in ...

Ferroelectric wurtzite-type aluminum scandium nitride (Al 1-x Sc x N) presents unique properties that can enhance the performance of non-volatile memory technologies. The realization of the full potential of Al 1-x Sc ...

It leads, on the one hand, to the different phase composition and polarization values, because V O concentration affects the relative stability of ferroelectric and non-ferroelectric phases [16,17]. On the other hand, reliability issues also cannot be independent of the electrode materials and processing conditions.

Web: https://degotec.fr