



Cite this: *Nanoscale*, 2020, **12**, 12177

Correction: Stabilization of negative capacitance in ferroelectric capacitors with and without a metal interlayer

T. Rollo, ^a F. Blanchini, ^b G. Giordano, ^c R. Specogna ^a and D. Esseni ^{*a}

DOI: 10.1039/d0nr90122a

rsc.li/nanoscale

Correction for 'Stabilization of negative capacitance in ferroelectric capacitors with and without a metal interlayer' by T. Rollo, *et al.*, *Nanoscale*, 2020, **12**, 6121–6129, DOI: 10.1039/C9NR09470A.

The authors regret that the value of β in the caption of Fig. 4 was incorrectly given as $4.5 \times 10^9 \text{ m}^5 \text{ C}^{-2} \text{ F}^{-1}$. The correct value of β is $2.25 \times 10^{10} \text{ m}^5 \text{ C}^{-2} \text{ F}^{-1}$. Fig. 4, along with the full corrected caption, is displayed below.

The Royal Society of Chemistry apologises for these errors and any consequent inconvenience to authors and readers.

^aDPIA, University of Udine, Via delle Scienze 206, 33100 Udine, Italy. E-mail: david.esseni@uniud.it

^bDMIF, University of Udine, Via delle Scienze 206, 33100 Udine, Italy

^cDII, University of Trento, via Sommarive 9, 38123 Povo, TN, Italy



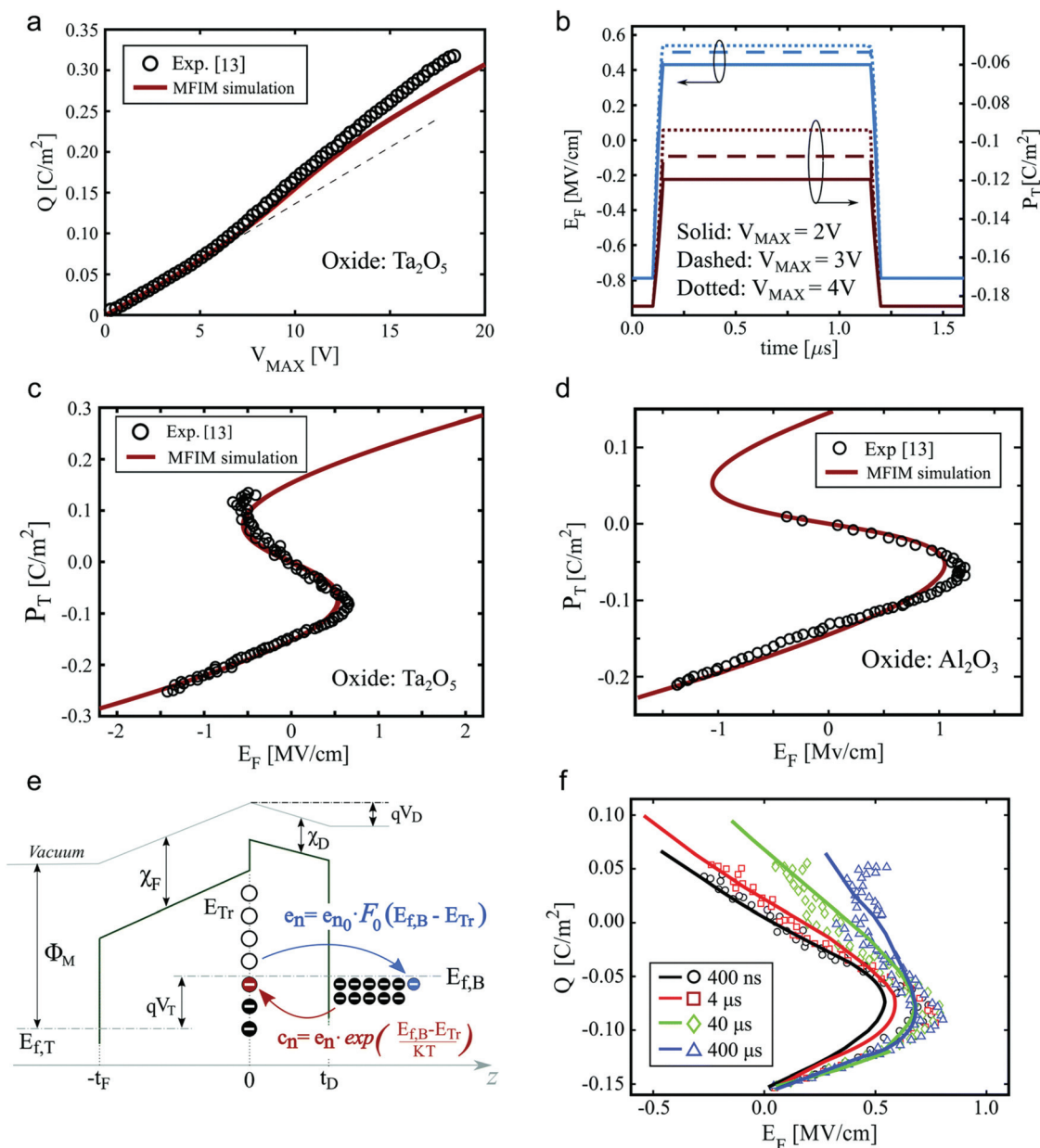


Fig. 4 Comparison between simulations and experiments. Measurements (symbols) and simulations (lines) for the MFIM structures in ref. 12 and 13. For the $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ - Ta_2O_5 capacitor the simulation parameters are $\epsilon_F = 33$, $\epsilon_D = 23.48$, $t_F = 11.6$ nm, $t_D = 13.5$ nm, $\alpha = -4.6 \times 10^8$ m⁻¹, and $\beta = 9.8 \times 10^9$ m⁵ C⁻² F⁻¹, while for the $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ - Al_2O_3 system the parameters are $\epsilon_D = 8$, $t_F = 7.7$ nm, $t_D = 4$ nm, $\alpha = -9.45 \times 10^8$ m⁻¹ and $\beta = 2.25 \times 10^{10}$ m⁵ C⁻² F⁻¹,^{12,13} for both capacitors we used $\rho = 0.5$ m Ω m and $k = 2 \times 10^{-9}$ m³ F⁻¹ m⁻¹. (a) Reversibly stored and released charge, Q , versus the top value V_{MAX} of the trapezoidal voltage waveform across the capacitor. (b) Simulated ferroelectric field and charge versus time produced by a trapezoidal input V_T with a pulse width of 1 μs and for different V_T amplitudes. (c) Polarisation versus ferroelectric electric field for the $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ - Ta_2O_5 MFIM capacitor. (d) Polarisation versus ferroelectric electric field for the $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ - Al_2O_3 capacitor. (e) Sketch of the band structure of the MFIM device with representation of the emission and capture mechanisms. (f) Simulated charge versus ferroelectric E_F curves for different pulse widths of the input signal and fixed density $N_T = 7.5^{12}$ eV⁻¹ cm⁻² of acceptor type interface traps with a uniform energy distribution. In these simulations the emission rate is $e_{n0} = 5 \times 10^4$ s⁻¹, the metal gate work-function is $\Phi_M = 4.05$ eV, and the electron affinity is $\chi_F = 2.2$ eV for $\text{Hf}_{0.5}\text{Zr}_{0.5}\text{O}_2$ and $\chi_D = 3.2$ eV for Ta_2O_5 .²⁹