Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information: Figures

Influence of Moisture on the Electrical Properties of Solution Processed Multilayer High-k ZrO_2-Capacitors

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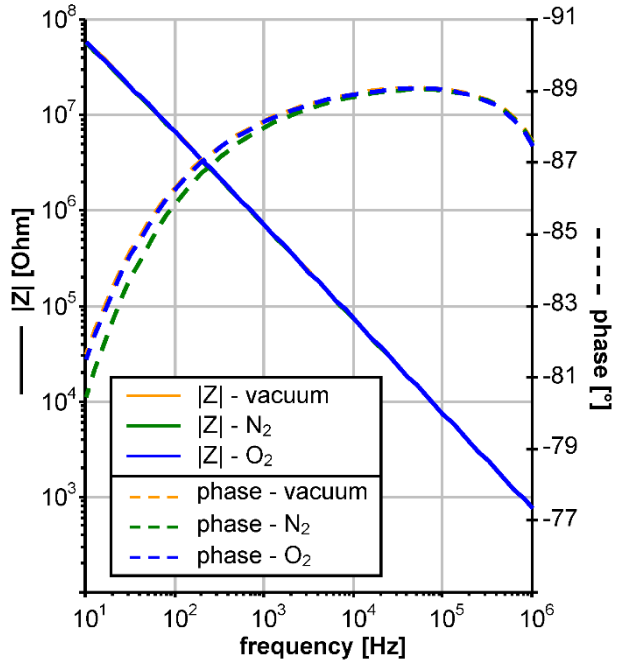

Fig. S1 Impedance (absolute value |Z| and phase θ) of a device measured after several hours in vacuum, in vacuum with adding N_2 and in vacuum with adding O_2 (Table 1, condition c)). No significant influence on the impedances could be observed during observations for approx. 20 minutes.

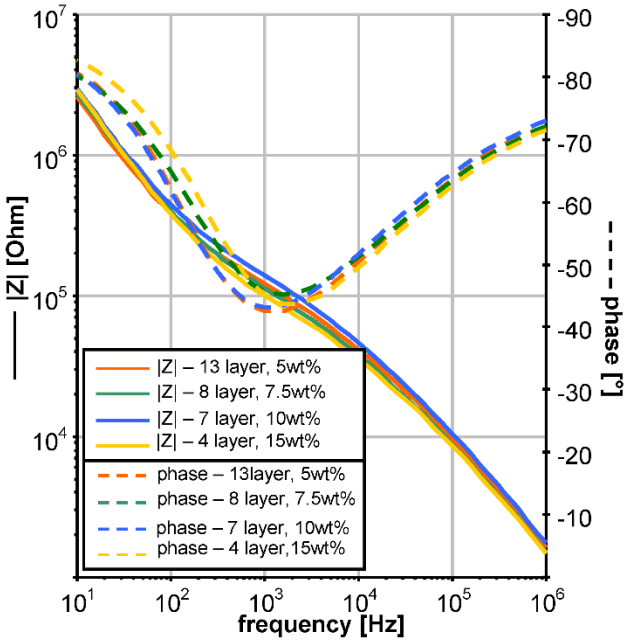

Fig. S2 Impedance (absolute value |Z| and phase θ) of four devices with different precursor concentrations and number of layers, resulting in the same total film thickness of ~200nm measured in air (Table 1, condition b)). No significant difference can be seen between the impedance of these devices. Small deviations are connected to the absence of a perfectly identical layer thickness (checked via REM and XRR).

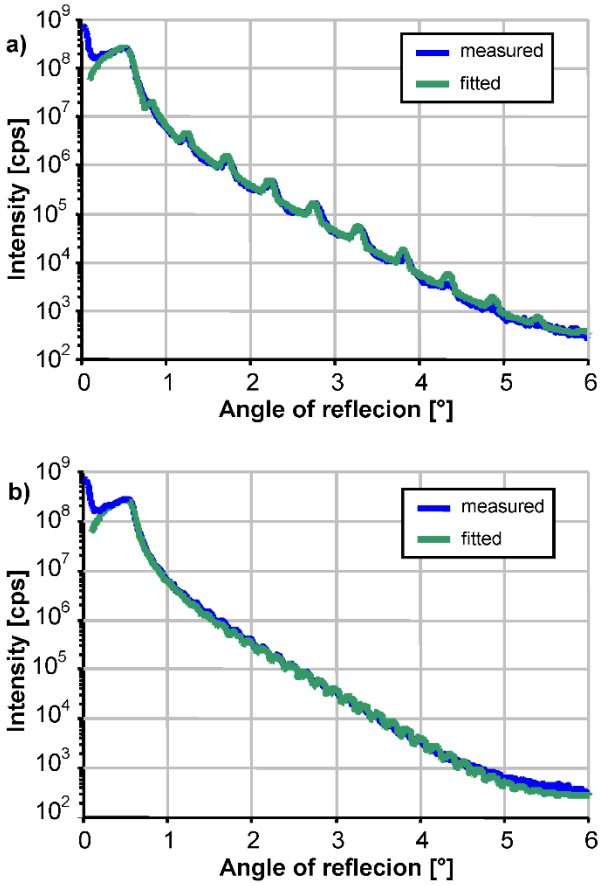

Fig. S3 XRR data and fit for two devices: a) 13 layers with 5% precursor concentration, resulting in a density of 4,4g/cm³, a surface roughness of 6,2Å and a single layer thickness of ~15nm and b) 4 layers with 15% precursor concentration, resulting in a density of 4,4g/cm³, a surface roughness of 5,9Å and a single layer thickness of ~51nm.

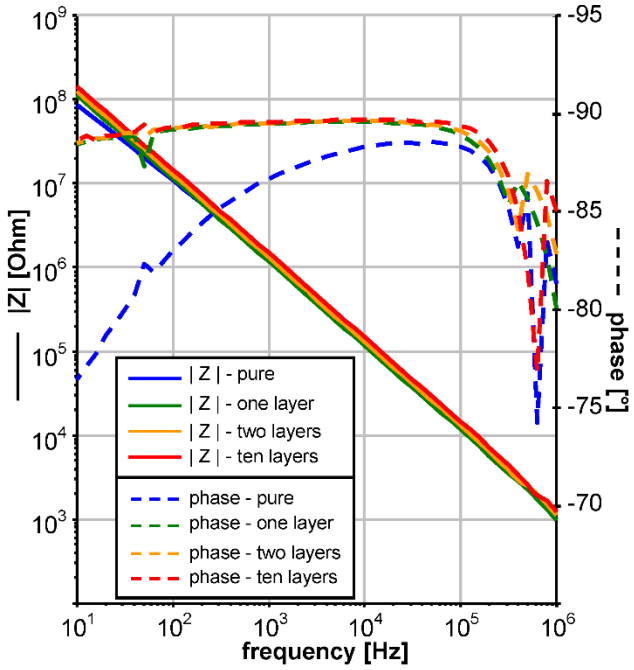

Fig. S4 Impedance (absolute value |Z| and phase θ) of four devices with different number of layers on top of the physical device measured after 10min at 130°C in argon (Table 1, condition a)): no encapsulation (pure), one layer, two layers and ten layers. A difference in the impedance can be observed between measurement data achieved with encapsulation or no encapsulation, although there is no significant influence of the number of encapsulation layers observable. The fluctuation of the phase in the high frequency regime can be neglected given that it is caused by the measuring instrument.

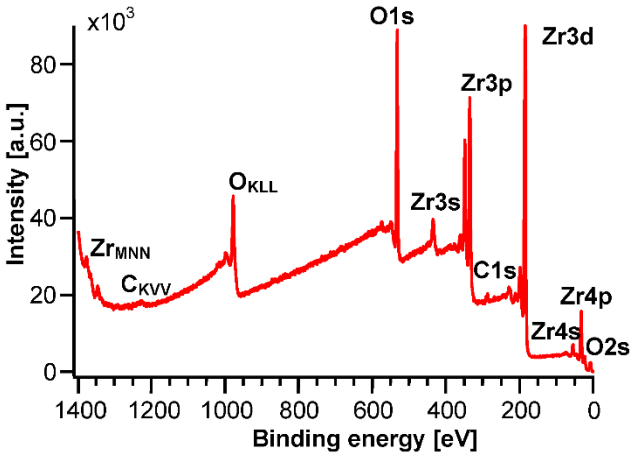

Fig. S5 Wide scan energy spectrum of ZrO_2 sample measured per XPS.