Supplementary Material for PCCP

Improved reliability from a plasma-assisted metal insulator metal capacitor comprising a high-*k* HfO_2 film on a flexible polyimide substrate

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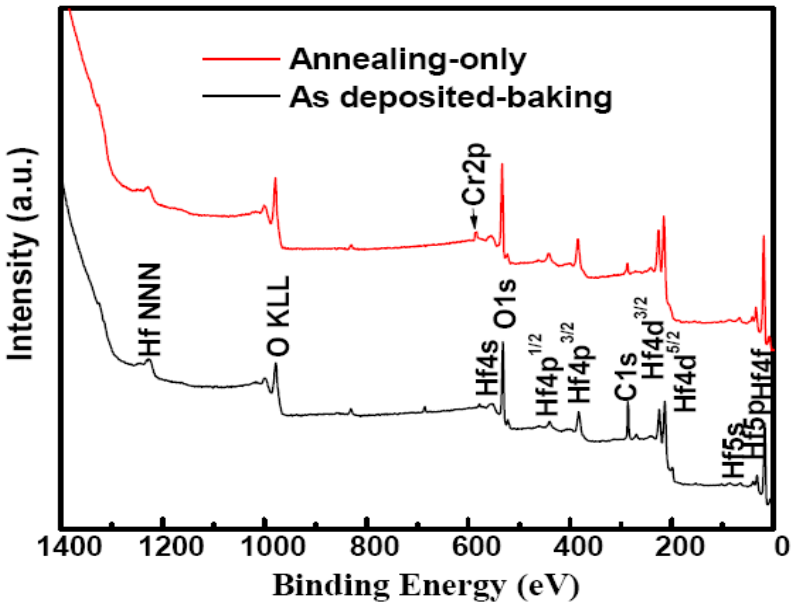

Fig. S1 Low resolution XPS spectra of sol-gel deposited HfO_2 film on Cr/PI substrate for as deposited-baking and annealing at 250ºC treated samples.

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The as-deposited film existed in the solid-state, presumably with a HO–Hf–O–Hf–OR model structure based structure. It appeared that a homogeneous network of –O–Hf–O–Hf–O– bonds had not developed in the film. In subsequent step, the power plasma induced the formation of some active oxygen species that reacted with model structure of HO–Hf–O–Hf–OR, resulting in partial oxidation to hafnium oxide. The imposing plasma gradually oxidized the as deposited thin film. In the final step, the film surface was near-complete oxidation to $–(O–Hf–O)_n–$ using plasma oxidation; the organic part were mostly removed. In addition, we recorded the low-resolution XPS spectra as shown in **Fig. S1** for HfO_2 film subjected to as-prepared sample, and C(1s) peak at around 286.6 eV is attributed to C-O-H from the ethanol solvent. The C(1s) peak for annealed sample is at around 285.0 eV and band intensity significantly decreases than the as deposited film due to solvent evaporation. The deposition of chromium thin film does not only promote the adhesion of sol-gel deposited high-k film, but also avoids the oxidation or degradation of underlying PI substrate as a consequence of oxygen plasma treatment.