Supporting Information

Engineering of Ferroelectric HfO_2-ZrO_2 Nanolaminates

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Prior studies by Kim et al. on ferroelectric HfO_2 has shown that decreasing the temperature in HfO_2 deposition to 240 °C increased the carbon concentration to ~10 atomic percent, leading to a decrease in lateral grain size and an increase in the remanent polarization in the films. To determine if carbon incorporation was playing a role in stabilizing the ferroelectric response of the nanolaminates in this study, high resolution x-ray photoelectron spectroscopy (XPS) scans in the C1s region were collected on the nanolaminates deposited at both 260 and 285 °C. The scans were collected after cleaning the surface with an Ar ion gun for 30s to remove adventitious carbon signal and are shown in figure S1. The scans reveal no C in the films within the detection limit of XPS in all of the films regardless of temperature, indicating the any C in the film is much less than the 10 atomic percent threshold where Kim et al. observed impurity induced stabilization. This leads us to conclude that C impurities aren't contributing to the observed ferroelectric response of the nanolaminates in this study.

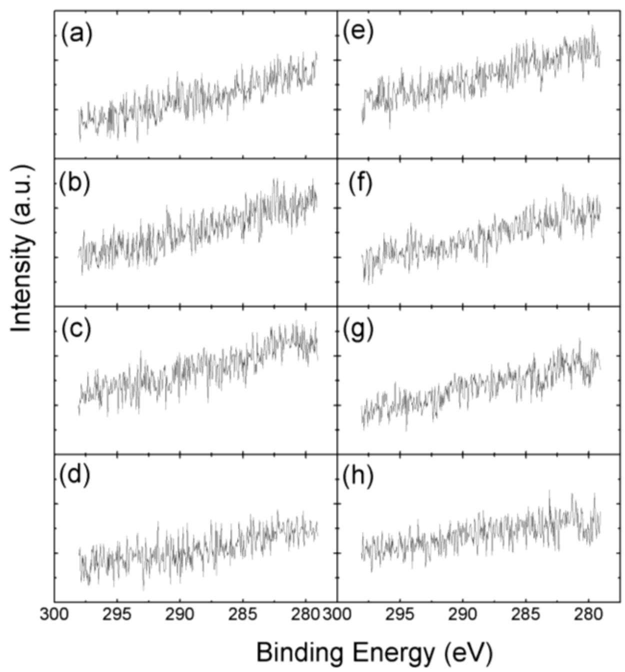

Figure S1. XPS scans of the C1s region for the $HfZrO_4$ solid solution, (1nm HfO_2/1nm ZrO_2)x4, (2nm HfO_2/2nm ZrO_2)x2, and (4nm HfO_2/4nm ZrO_2) nanolaminates for films deposited at 285 °C are shown in (a, b, c, and d) respectively, while the scans from those deposited at 260 °C are shown in (e, f, g, and h) respectively.