



Figure 1. a) HelsinkiALD cluster tool, b) LEIS spectra up to 33 cycles of HfO₂ deposition on TiN, c) Hf 4f XPS spectra of 5, 10, 30, 40, 50 cycles of HfO₂ deposited on TiN. The line on the spectra indicates the binding energy shift which varies with the number of deposition cycles.