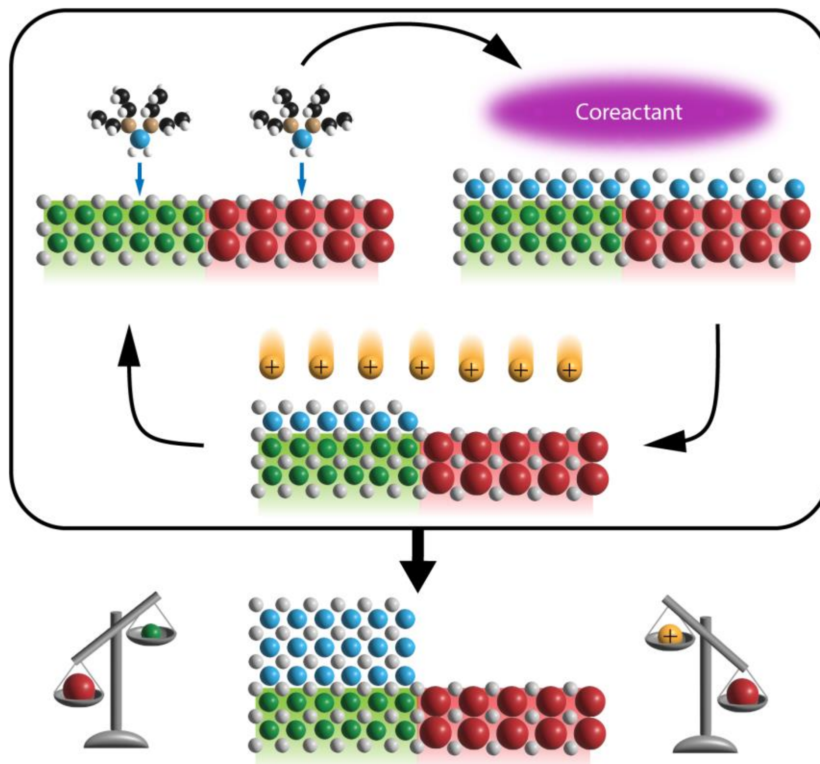

Figure 1: Schematic of a physical approach to ASD. A non-selective ALD process is combined with sputter etching by ions. These ions are much more effective at etching material on substrates containing heavy atoms, resulting in a net deposition only on surfaces without heavy atoms. The mass of the incoming ion should be smaller than the mass of the heavy atoms.

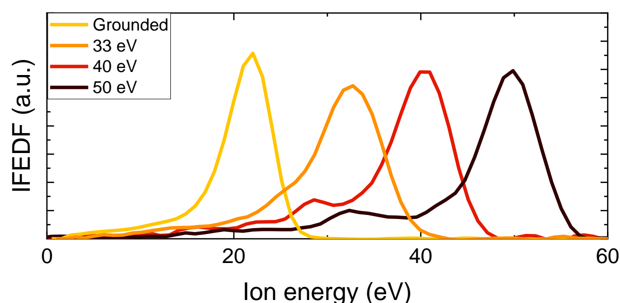

Figure 2: Ion flux energy distribution functions (IFEDFs) of the Ar plasmas used in this work, as measured by a retarded field energy analyzer.

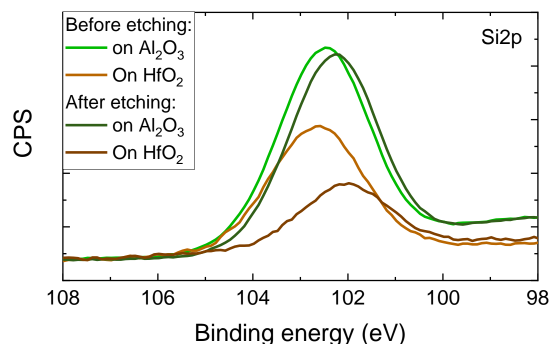

Figure 3: Si2p x-ray photoelectron spectroscopy (XPS) spectra for three SiO_2 ALD cycles on Al_2O_3 and HfO_2, before and after a $5.6 \cdot 10^{17}$ cm^{-2} Ar ion dose at 40 eV.

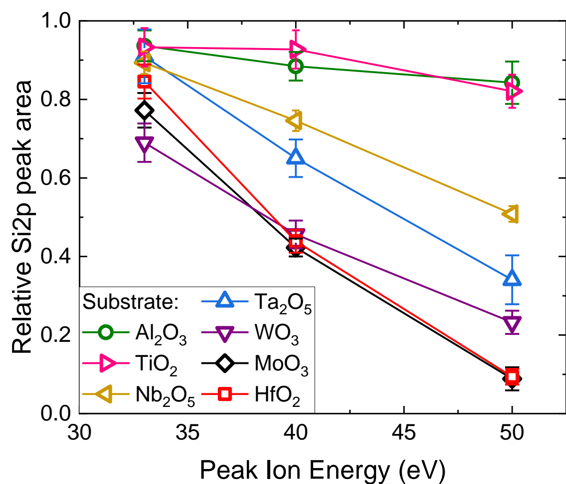

Figure 4: Relative Si2p peak area of SiO_2 after a $5.6 \cdot 10^{17}$ cm^{-2} Ar ion dose, for various peak ion energies, as measured by XPS. This relative Si2p peak area after etching is normalized to the Si2p peak area before etching. The SiO_2 was deposited by three ALD cycles. Significant differences in etch rates are observed for different substrate material.

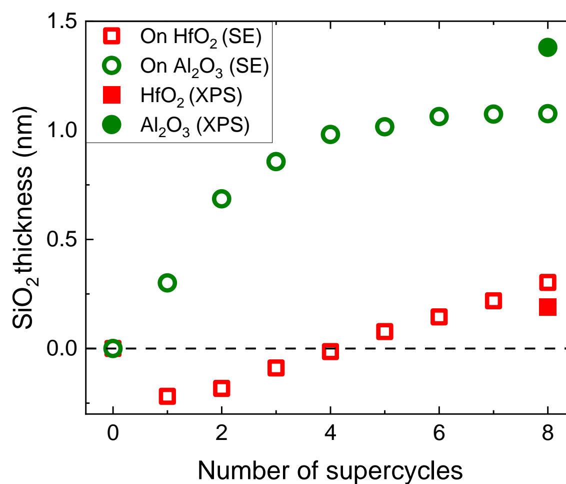

Figure 5: SiO_2 thickness on HfO_2 and Al_2O_3 as measured by in-situ spectroscopic ellipsometry (SE, open symbols) after each deposition-etch supercycle. Such supercycle consists of three SiO_2 ALD cycles followed by a $1.0 \cdot 10^{18}$ cm^{-2} Ar ion dose at 40 eV peak ion energy. The SiO_2 thickness has also been determined by XPS after eight supercycles (closed symbols).