Epitaxial Thin Films of Y doped HfO$_2$ CLAUDY SERRAO, ASIF KHAN, RAMESH RAMAMOORTHY, SAYEEF SALAHUDDIN, UC Berkeley — Hafnium oxide (HfO$_2$) is one of a few metal oxides that is thermodynamically stable on silicon and silicon oxide. There has been renewed interest in HfO$_2$ due to the recent discovery of ferroelectricity and antiferroelectricity in doped HfO$_2$. Typical ferroelectrics – such as strontium bismuth tantalate (SBT) and lead zirconium titanate (PZT) – contain elements that easily react with silicon and silicon oxide at elevated temperatures; therefore, such ferroelectrics are not suited for device applications. Meanwhile, ferroelectric HfO$_2$ offers promise regarding integration with silicon. The stable phase of HfO$_2$ at room temperature is monoclinic, but HfO$_2$ can be stabilized in the tetragonal, orthorhombic or even cubic phase by suitable doping. We stabilized Y-doped HfO$_2$ thin films using pulsed laser deposition. The strain state can be controlled using various perovskite substrates and controlled growth conditions. We report on Y-doped HfO$_2$ domain structures from piezo-response force microscopy (PFM) and structural parameters via X-ray reciprocal space maps (RSM). We hope this work spurs further interest in strain-tuned ferroelectricity in doped HfO$_2$. 

Claudy Serrao
UC Berkeley

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