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Stability of point defects in SrTiO₃ substrates during thin film deposition EMMANUEL TOWETT, SHEHNAZ JEDDY, GREGG JANOWSKI, University of Alabama at Birmingham, CHARLES BROOKS, DARRYL SCHLOM, Pennsylvania State University, MARY ELLEN ZVANUT, University of Alabama at Birmingham — During deposition of multiferroic films on SrTiO₃, the substrate is subjected to ambients similar to those known to alter the oxygen vacancy concentration and conductivity. We have performed electron paramagnetic resonance (EPR) measurements on SrTiO₃ substrates at selected stages during film deposition as well as during controlled heat treatments. Fe³⁺, Cr³⁺ and an Fe-oxygen vacancy complex, Fe³⁺Vₒ, were monitored during isochronal and isothermal vacuum (10⁻⁶ Torr) and 1 atm O₂ heat treatments between 200 and 800 °C. As expected, processing steps involving O₂ at 950 °C reduces the concentration of Fe³⁺Vₒ, consistent with the O₂ annealing study. Film deposition at 650 °C, 5x10⁻⁷ Torr with 10% ozone returns the Fe³⁺Vₒ signal to the original intensity, consistent with vacuum treatments which follow 1 atm O₂ annealing. Surprisingly, isochronal and time-dependent vacuum and O₂ annealing produce the same trend for the Fe³⁺Vₒ signal for T > 500 °C. The results of all the studies suggest that electrostatic changes, as evidenced by variations in the intensity of Fe³⁺ and Cr³⁺, as well as oxygen vacancy migration can alter substrate characteristics during film growth.

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