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Stability of point defects in $SrTiO_3$ 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 $SrTiO_3$, 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 $SrTiO_3$ substrates at selected stages during film deposition as well as during controlled heat treatments. Fe^{3+}, Cr^{3+} and an Fe-oxygen vacancy complex, $Fe^{3+}V_o$, were monitored during isochronal and isothermal vacuum (10^{-6} Torr) and 1 atm O_2 heat treatments between 200 and 800 °C. As expected, processing steps involving O_2 at 950 °C reduces the concentration of $Fe^{3+}V_o$, consistent with the O_2 annealing study. Film deposition at 650 °C, 5x10^{-7} Torr with 10% ozone returns the $Fe^{3+}V_o$ signal to the original intensity, consistent with vacuum treatments which follow 1 atm O_2 annealing. Surprisingly, isochronal and time-dependent vacuum and O_2 annealing produce the same trend for the $Fe^{3+}V_o$ signal for T > 500 °C. The results of all the studies suggest that electrostatic changes, as evidenced by variations in the intensity of Fe^{3+} and Cr^{3+}, as well as oxygen vacancy migration can alter substrate characteristics during film growth.

Mary Ellen Zvanut
University of Alabama at Birmingham

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