Annealing effect on the Crystallinity and Stress of Yttria-Stabilized Zirconia Epitaxial thin films

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Yttria-stabilized zirconia (YSZ) is common material for thermal-barrier coatings, optical components, oxygen sensors and buffer layers for epitaxial growth. YSZ exists in tetragonal and cubic crystalline phases. Usually, tetragonal structure is not used due to low phase stability. Many of the studies into buffer layer for epitaxial growth have focused on Yttria oxide 8–10 mol\% in zirconia oxide. YSZ thin films on Silicon substrate have low crystalline quality due to lattice mismatch with Si. At that reason, the perovskite materials deposited on YSZ thin films have a low quality compare to single crystal substrate. In this study, enhanced the YSZ thin films crystal quality and controlled the lattice parameter by post annealing process. We deposited the epitaxial YSZ thin films on Si substrate by Pulsed Laser Deposition. And the YSZ thin films annealed at 1,100 °C for various conditions. The crystalline quality, orientation, and lattice constant for the YSZ thin films was assessed using XRD. Finally, compare to the perovskite thin films grown on annealed and as-grown YSZ thin films.

Fig 1. The unit cell structure of Yttria-stabilized zirconia.