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Growth environments depends interface and surface characteristics of yttria-stabilized zirconia thin films†

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There have been large research activities on the high quality oxide films for the realization oxide based electronics. However, the interface interdiffusion prohibits achieving high quality oxide films, when the oxide films are grown on non-oxide substrates. In the case of Si substrates, there exist lattice mismatch and interface interdiffusion when oxide films deposited on direct Si surface.

In this presentation, we report the interface characteristics of yttria-stabilized zirconia films grown on silicon substrates. From x-ray reflectivity analysis we found that the film thickness and interface roughness decreased as the growth temperature increased, indicating that the growth mechanism varies and the chemical reaction is limited to the interface as the growth condition varies. Furthermore, the packing density of the film increased as the growth temperature increased and the film thickness decreased. X-ray photoelectron spectroscopy analysis of very thin films revealed that the amount of chemical shift increased as the growth temperature increased. Intriguingly, the direction of the chemical shift of Zr was opposite to that of Si due to the second nearest neighbor interaction.

References

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