Comparison between cyclopentadienyl-based SrO and MgO ALD: an in-situ spectroscopic ellipsometry investigation

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Non-ideal behaviors are stressed:
• Precursor chemistry
• Substrate effect
• Temperature effect
• Even more...

ALD CHEMISTRY

The overall stoichiometry of alkaline earth oxide (AEO) ALD is poorly understood and usually complicated by the basicity of AEO films.

Sr(C₅H₅Pr₃H₂)₂ + H₂O → SrO + 2H(C₅H₅Pr₃H₂)
Mg(C₅H₅)₂ + H₂O → MgO + 2H(C₅H₅)

Sr(OH)₂ (i) 250 °C, <100 cycles
SrO GPC ~0.3 nm/cycle
Crystalline SrO

Sr(OH)₂ (ii) 350 °C
SrO GPC ~0.2 nm/cycle
Crystalline SrO

Substrate effect

The upper deposition temperature can be as high as 390 °C, without noticeable precursor decomposition.

Substrate effect

The interfacial solid state reaction of Sr²⁺ vs. Mg²⁺ diffusivity in SiO₂

Reference