

# LS-MOCVD OF BARIUM STRONTIUM TITANATE THIN FILMS USING NOVEL PRECURSORS

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Perovskite-type titanate dielectrics have attracted much attention in memory devices such as DRAMs or FeRAMs due to their high dielectric constants. However, low volatility of the Ba, Sr, Pb or Zr precursors with only thd ligands has limitations in obtaining high quality thin films by liquid source metal organic chemical vapor deposition (LS-MOCVD) processes. To improve the volatility of these precursors, many attempts have been made such as adding polyether ligands to satisfy the coordinative saturation.

We report the synthesis of new precursors Ba(thd)<sub>2</sub>(tmeea) and Sr(thd)<sub>2</sub>(tmeea), where tmeea = tris[2-(2-methoxyethoxy)ethyl]amine, and LS-MOCVD of barium strontium titanate (BSTO) thin films using these precursors. Due to increased basicity of amines compared with ethers, it is expected that the nitrogen-donor ligand will make a strong bond to a metal than an analogous oxygen-donor ligand, consequently improving the volatility and thermal behavior of these precursors.

Thin films of BSTO were grown on Pt(111)/SiO<sub>2</sub>/Si(100) substrates by LS-MOCVD using a cocktail source consisting of the conventional Ti precursor Ti(thd)<sub>2</sub>(O<sup>i</sup>Pr)<sub>2</sub> and these new Ba and Sr precursors. As-grown films were characterized by XPS, SEM, XRD, XRF, and C-V and I-V measurements. BSTO films grown at 420 °C were stoichiometric barium strontium titanate with very smooth surface morphology and their dielectric constants were found to be as large as 450. Dependence of the composition, microstructure and the electrical properties of the BSTO films on the growth temperature, annealing temperature, working pressure, and the composition of the cocktail source will be discussed.