플라즈마 원자층증착법에 의해 제조된 강유전체 SrBi2Ta2O9박막의 특성
(Characteristics of Ferroelectric SrBi2Ta2O9 Thin Films deposited by Plasma-Enhanced Atomic Layer Deposition)

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Recent progress in the integration of the ferroelectric random access memories (FRAM) has attracted much interest. Strontium bismuth tantalate(SBT) is one of the most attractive materials for use in nonvolatile-memory applications due to low-voltage operations, low leakage current, and its excellent fatigue-free property. High-density FRAMs operated at a low voltage below 1.5V are applicable to mobile devices operated by battery. SBT films thinner than 0.1 ㎛ can be operated at a low voltage, because the coercive voltage (*Vc*) decreases as the film thickness is reduced. In addition, the thickness of the SBT film will have to be reduced so it can fit between adjacent storage nodes in a pedestal type capacitor in future FRAMs.

As an alternative deposition technique, atomic layer deposition (ALD) has been widely studied recently. Due to the inherent atomic level control and self-saturation chemistry, the films formed by ALD are highly conformal and uniform. Moreover, low-temperature growth is possible, and chemical composition is uniform in multi-component system.

We report the fabrication of sub-100nm SBT thin films at low temperature by plasma-enhanced atomic layer deposition (PEALD), and then investigate the low voltage switching characteristics of Pt/SrBi2Ta2O9/Pt capacitor structures.

The sub-100nm SrBi2Ta2O9 (SBT) thin films have fabricated using PEALD with an alternating supply of single cocktail source and O_2 plasma. The thickness of SBT thin film increases linearly with number of cycles, and the deposition rate is about 0.09 nm per cycle. The SBT film exhibits well-saturated polarization above 1.5V. Remanent polarization (*2Pr*) and coercive voltage (*Vc*) measured at 3.0 V of applied voltage were 13.0 uC/cm^2 and 0.39 V, respectively. The results of this study strongly suggest that PEALD is effective for sub-100nm SBT thin films with excellent ferroelectric properties, which are applicable to high-density ferroelectric memory devices operated at low voltage.