

## 화학적기계적연마 공정으로 제조한 BLT Capacitor의 Polishing Damage에 의한 강유전 특성 열화

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### Degradation from Polishing Damage in Ferroelectric Characteristics of BLT Capacitor Fabricated by Chemical Mechanical Polishing Process

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**Abstract :** (Bi,Lu)Ti<sub>3</sub>O<sub>12</sub>(BLT) thin film is one of the most attractive materials for ferroelectric random access memory (FRAM) applications due to its some excellent properties such as high fatigue endurance, low processing temperature, and large remanent polarization [1-2]. The authors firstly investigated and reported the damascene process of chemical mechanical polishing (CMP) for BLT thin film capacitor on behalf of plasma etching process for fabrication of FRAM [3]. CMP process could prepare the BLT capacitors with the superior process efficiency to the plasma etching process without the well-known problems such as plasma damages and sloped sidewall, which was enough to apply to the fabrication of FRAM [2]. BLT-CMP characteristics showed the typical oxide-CMP characteristics which were related in both pressure and velocity according to Preston's equation and Hernandez's power law [2-4]. Good surface roughness was also obtained for the densification of multilevel memory structure by CMP process [3]. The well prepared BLT capacitors fabricated by CMP process should have the sufficient ferroelectric properties for FRAM; therefore, in this study the electrical properties of the BLT capacitor fabricated by CMP process were analyzed with the process parameters. Especially, the effects of CMP pressure, which had mainly affected the removal rate of BLT thin films [2], on the electrical properties were investigated. In order to check the influences of the pressure in CMP process on the ferroelectric properties of BLT thin films, the electrical test of the BLT capacitors was performed. The polarization-voltage (*P-V*) characteristics show a decreased the remanent polarization (*P<sub>r</sub>*) value when CMP process was performed with the high pressure. The shape of the hysteresis loop is close to typical loop of BLT thin films in case of the specimen after CMP process with the pressures of 4.9 kPa; however, the shape of the hysteresis loop is not saturated due to high leakage current caused by structural and/or chemical damages in case of the specimen after CMP process with the pressures of 29.4 kPa. The leakage current density obtained with positive bias is one order lower than that with negative bias in case of 29.4 kPa, which was one or two order higher than in case of 4.9 kPa. The high pressure condition was not suitable for the damascene process of BLT thin films due to the defects in electrical properties although the better efficiency of process by higher removal rate of BLT thin films was obtained with the high pressure of 29.4 kPa in the previous study [2].

**Key Words :** BLT, Chemical mechanical polishing (CMP), Polishing Damage, Ferroelectric Characteristics

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