

Effect of Al Doping Concentration on Resistance Switching Behavior of Sputtered Al-doped MgOx Films

이규민, 김종기, 박성훈, 손현철

연세대학교 신소재 공학과

In this study, we investigated that the resistance switching characteristics of Al-doped MgOx films with increasing Al doping concentration and increasing film thickness. The Al-doped MgOx based ReRAM devices with a TiN/Al-doped MgOx/Pt/Ti/SiO₂ were fabricated on Si substrates. The 5 nm, 10 nm, and 15 nm thick Al-doped MgOx films were deposited by reactive dc magnetron co-sputtering at 300°C and oxygen partial ratio of 60% (Ar: 16 sccm, O₂: 24 sccm). Micro-structure of Al-doped MgOx films and atomic concentration were investigated by XRD and XPS, respectively. The Al-doped MgOx films showed set/reset resistance switching behavior at various Al doping concentrations. The process voltage of forming/set is decreased and whereas the initial current level is increased with decreasing thickness of Al-doped MgOx films. Besides, the initial current of Al-doped MgOx films is increased with increasing Al doping concentration in MgOx films. The change of resistance switching behavior depending on doping concentration was discussed in terms of concentration of non-lattice oxygen of Al-doped MgOx.

Keywords: Resistance switching, Doping, Thickness, MgOx