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THERMAL STABILITY OF RuO_2 AND Ru THIN FILMS IN THE VARIOUS AMBIENTS,

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In recent years, RuO_2 and Ru thin films have been widely investigated for their application in integrated ferroelectric capacitors, due to their excellent etching properties, oxygen diffusion barrier characteristics and so on. In this study, we fabricated stoichiometric RuO_2 and Ru thin films by conventional dc magnetron sputtering and then systematically investigated their thermal stability in the various ambient to check the applicability for integrated ferroelectric capacitors. Annealing was done in oxygen, argon and vacuum ambient between 400°C and 800°C for 30 min.

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DEGRADATION MECHANISM OF *Pt/Ti* THIN FILMS DUE TO ANNEALING IN AN OXYGEN AMBIENT,

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Pt/Ti thin films are widely used as a bottom electrode for a ferroelectric materials. The annealing at high temperature in an oxygen ambient to get optimum dielectric properties degrades the adhesion between Pt/Ti thin film and substrate. We investigate the degradation mechanism of Pt/Ti thin films after annealing in an oxygen ambient. Ti and Pt films were successively deposited onto SiO_2/Si and SiN_x/Si substrates by using DC magnetron sputtering system. The specimens were annealed in an oxygen and a vacuum ambient. The adhesion of Pt/Ti thin films were evaluated by adhesive tape test, scratch test, and peel test. The TiO_2 phase which formed after annealing in oxygen results in the volume expansion. Adhesion degradation after oxygen annealing is attributed to the formation of the brittle TiO_2 phase, the depletion of Ti adhesion layer, and the increase of internal stress.

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ELECTRICAL PROPERTIES OF PZT THIN FILMS DEPOSITED ON Ir, IrO_2 BOTTOM ELECTRODES BY REACTIVE SPUTTERING,

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Polycrystalline PZT thin films were prepared on Pt, Ir and IrO_2 electrods, Electrode materials such as Ir and IrO_2 were annealed to increase crystallinity of films. Ir were annealed in Ar while IrO_2 were annealed in O_2. Crystallinity and morphology were examined by XRD, SEM, and AFM. Microstructure and interface were observed using TEM and AES. High quality of PZT thin film was obtained by using IrO_2. There was no appreciable roughening of the interface between the PZT and the IrO_2, though Ir electrode has rough surface. IrO_2 phase was formed by the oxidation of Ir electrode by reaction with oxygen during deposition process. Electrical properties of PZT thin films using IrO_2 electrodes were better than that of Pt and Ir electrods, especially PZT thin film using IrO_2 electrode showed no fatigue up to 10^{11} cycles.

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CHARACTERISTICS OF SOL-GEL PZT FERROELECTRIC CAPACITOR FOR Ir ELECTRODES.

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Pt electrode is the most conventional electrode material for ferroelectric capacitors. However, the capacitor with Pt electrode exhibits a problem for fatigue behaviors. Conductive oxides, such as IrO_2, are suggested as new electrode materials for ferroelectric capacitors, because they might avoid the fatigue issues due to their high oxygen contents. Since Ir could be easily oxidized while keeping high electrical conductivity, Ir electrode might lead to fatigue-free ferroelectric characteristics.

In this study, sol-gel PZT capacitor was prepared in order to investigate the effect of Ir electrode. The 2000Å thick bottom electrode of ferroelectric capacitor was deposited by sputtering. 3500Å PZT film were deposited by sol-gel method. PZT perovskite phase shown (001) and (111) peak of perovskite structure was observed by XRD. Characteristics of ferroelectric capacitor were measured for hysteresis and fatigue behaviors by RT66A. The remnant polarization (Pr) and the coercive field (Ec) were 30μC/cm^2 and 70kV/cm on applied voltage of 5V. The sample showed no significant fatigue manes up to 10^9 cycles under ±10V large square signal for 1MHz

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