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열처리 효과에 의한 ZrO_2 박막과 Si 기판 사이의 계면특성에 관한 연구

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The ultrathin zirconium oxide films were grown with various gas flow ratios (O_2:Ar) by r.f.-magnetron sputtering to investigate the interfacial properties between ZrO_2 thin films and Si substrate by heat treatment. The stoichiometric ZrO_2 films with the smooth surface could be obtained by controlling oxygen ratio to argon. The Zr-free SiO_2 interfacial layer thickness abruptly increased at the annealing temperature of 750℃, due to rapid oxygen diffusion through the ZrO_2. Also, the Zr silicide layer was observed between ZrO_2 and Zr silicate by X-ray photoelectron spectroscopy (XPS). This is explained by excess Si due to rapid diffusivity of Si into the structure resulting in forming the silicide layer on Zr silicate. With the increase of annealing temperature the accumulation capacitance of the films decreases, especially above 650℃, due to the great thickness increase of the interfacial layer. with the increase of annealing temperature the accumulation capacitance of the films decreases, especially above 650℃, due to the great thickness increase of the interfacial layer. However, it resulted in the greatly improved leakage current of 7.86 10^{-9} A/cm^2 at an applied voltage of 1 V after 750℃ annealing.