【T-24】

Growth of TiO_2 thin films on Si(100) and Si(111) substrates using MOCVD and comparison of growth behavior and structural properties

C.-K. Jung, S.-B. Lee, J.-H. Boo,
Department of Chemistry and Institute of Basic Science, Sung kyun kwan University, 300 Chunchun-Dong, Jangan-Gu, Suwon 440-746, South Korea

Growth of titanium dioxide (TiO_2) thin films on Si(100) and Si(111) substrates were carried out using a single molecular precursor ($Ti[OCH(CH_3)_2]_4$, 97%, TIP) at deposition pressure in the range of 5.0 X 10^{-5} Torr at deposition temperature in the range of 750 ℃ by the metal organic chemical vapor deposition (MOCVD) method. X-ray diffraction results clearly showed different growth behaviors between Si(100) and Si(111) substrates. The main film growth directions are [110] on Si(100) and [200] on Si(111), respectly. Transmission electron microscope images showed a quite smooth surface with no cracks and sharp interface between films layers, suggesting good adhesion and uniformity in depth. In the case of TiO_2 films on Si(111) substrate, transmission electron diffraction pattern showed a mixed structure with spot and ring pattern, resulting in polycrystalline film formation. But on Si(100) substrate, strong spot images with weak ring pattern were observed, indication that the film growth direction was strongly affected by Si wafers. Also, The films were investigated using rutherford backscattering spectroscopy (RBS) and secondary ion mass spectroscopy (SIMS) analysis. RBS analysis showed that the films are nearly stoichiometric. Contamination of the TiO_2 films on Si(100) and Si(111) substrates have been studied by SIMS analysis. And depth profile of oxygen and titanium were investigated by SIMS analysis.