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**Growth behavior and structural properties of titanium dioxide thin films on Si(100) and Si(111) substrates using single molecular precursor by high vacuum MOCVD**

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We have deposited titanium dioxide (TiO<sub>2</sub>) thin films on Si(100) and Si(111) substrates at temperature in the range of 500 to 750 °C and at pressure in the range of  $3.0 \times 10^{-7} \sim 5.0 \times 10^{-5}$  Torr using a single molecular precursor such as titanium (IV) iso-propoxide (Ti[OCH(CH<sub>3</sub>)<sub>2</sub>]<sub>4</sub>, 97%) by high vacuum metal-organic chemical vapor deposition (MOCVD) method. Highly oriented, stoichiometric TiO<sub>2</sub> thin films with rutile phase were successfully deposited on both Si(100) and Si(111) substrates between 650 and 750 °C under the working pressure of  $1.0 \times 10^{-5}$  Torr. XRD results clearly showed different growth behavior between Si(100) and Si(111) substrates. The main film growth directions are [110] on Si(100) and [200] on Si(111), respectively. SEM and TEM images showed a quite smooth surface with no cracks and sharp interface between film layers, suggesting good adhesion and uniformity in depth. In the case of TiO<sub>2</sub> films grown under low temperature below 600 °C and high pressure above  $3.0 \times 10^{-5}$  Torr, TED pattern showed a mixed structure with spot and ring patterns, resulting in polycrystalline film formation. With increasing the growth temperature to 650 °C and decreasing the pressure to  $3.0 \times 10^{-7}$  Torr, however, a strong spot images with weak ring pattern were observed, indicating that the film crystallinity as well as growth direction was strongly affected by deposition temperature and pressure.