TiO_2 thin film deposition using new class of precursors.

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Abstract: Electroceramic oxides are under intense investigation because of their requirement in various high technological fields. Materials like $SrTiO_3$ and $(Ba,Sr)TiO_3$ are extensively used for such applications. Metalorganic chemical vapor deposition is used as deposition technique, because it can provide excellent step coverage, a high deposition rate, and composition control. TiO_2 forms one of the important components of these materials. Design changes were included in well known Titanium precursors. A new volatile, low-melting, MOCVD precursor for TiO_2 has been developed. Compared to widely used titanium alkoxide precursors the new precursor showed improved air stability. The neutral, monomeric titanium complex is coordinatively saturated by a versatile, bidentate β-ketoester ligand. Detailed experiments were carried out to investigate the thermal properties and suitability to MOCVD. A comparative thermal study has been carried out with conventional Ti mixed alkoxide and β-diketonate complexes. Considerable changes were observed in the thermal properties of the complex. Preliminary MOCVD experiments were conducted in a home built horizontal cold wall reactor. Depositions were carried out on Si (100) substrates using various experimental conditions. Dense, uniform and crystalline TiO_2 films can be grown using this precursor on Si(100) substrates over a wide range of temperatures without the use of additional oxygen. Films were characterized by XRD and SEM.