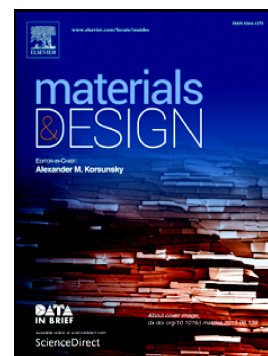


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Wafer-scale fabrication of conformal atomic-layered TiO₂ by atomic layer deposition using tetrakis (dimethylamino) titanium and H₂O precursors

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Abstract

The synthesis of ultra-thin atomic-layered oxides with precise thickness controllability and excellent uniformity remains a significant challenge in the fields of photovoltaics and optoelectronics. The wafer-scale synthesis and conformal growth of atomic-layered TiO₂ film on Si/SiO₂ substrate achieved by the atomic layer deposition (ALD) using tetrakis (dimethylamino) titanium (TDMAT) precursor and H₂O as an oxidation agent. Spectroscopic ellipsometry and atomic force microscopy (AFM) studies confirmed the conformal growth of TiO₂ layer with the average thickness of $\sim 0.37 \pm 0.04$ nm over 4-inch Si/SiO₂ wafer. Atomic-layered TiO₂ films were obtained by the careful selection of the deposition temperature and a number of precursor's cycles, which were summarized into developed recipe. Fourier transform infrared (FTIR) spectroscopy revealed the vibration mode of Ti-O-Ti and Ti-O-Si on the deposited film confirming the development of structural bonding between ALD-developed TiO₂ layer and Si/SiO₂ substrate. *In-situ* X-ray diffraction (XRD) measurement showed the crystalline structure

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