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Title:

Device Application for Epitaxial Anatase TiO<sub>2</sub> Using Termination Layer Control

Abstract:

Here we present a depletion-mode epitaxial anatase TiO<sub>2</sub> MESFET using Pt as the Schottky gate electrode. A series of devices were fabricated using pulsed laser deposition to epitaxially deposit one monolayer of LaO on LaAlO<sub>3</sub> (001) substrates with atomic-layer precision, followed by anatase TiO<sub>2</sub> thin films. The LaO monolayer was deposited following a recent study reporting that epitaxial TiO<sub>2</sub> thin films grown on LaO-terminated LaAlO<sub>3</sub> (001) substrates show a high mobility metallic state with outstanding crystalline quality. Excellent rectifying behavior was achieved at the Pt/anatase TiO<sub>2</sub> Schottky junction with a gate leakage as low as  $10^{-3}$  A/cm<sup>2</sup>. As a result, the on/off current ratio of epitaxial anatase TiO<sub>2</sub> MESFET exceeded a million in a voltage range of 3 V at room temperature. These results demonstrate that carriers can be easily tuned in a wide range, and imply that exotic transport properties can be further studied in the same device structure.