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Low-temperature growth of Ga_2O_3 thin films by PEALD

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Thin films of gallium oxide (Ga_2O_3) were deposited on silicon (100) through plasma-assisted atomic layer deposition with alternating supply of trimethylgallium and oxygen plasma at low substrate temperatures of 80 to 200 °C. The optical and electrical properties as well as the chemical composition of the Ga_2O_3 films were investigated by spectroscopic ellipsometry (SE), capacitance-voltage (C-V) measurements, and X-ray photoelectron spectroscopy (XPS) documenting the high quality of the films. A constant growth rate of ~ 0.66 Å per cycle accompanied by a low inhomogeneity of $\leq 2\%$ was determined from the SE data for all temperatures. We found a temperature-independent refractive index (1.86 ± 0.01 at 632.8 nm) whereas the optical bandgap decreased with increasing temperature (from 4.68 to 4.57 eV). XPS analysis revealed an almost ideal Ga:O ratio of 2:3 for all temperatures, with the lowest carbon contamination ($\sim 10\%$) for deposition at 150 °C. Furthermore, from the C-V data a permittivity of 9.7 ± 0.2 (at 10 kHz) as well as fixed and mobile oxide charge densities in the order of 1 to 4×10^{12} cm^{-2} were deduced.

Part:	DS
Type:	Vortrag;Talk
Topic:	Thin Film Properties: Structure, Morphology and Composition (XRD, TEM, XPS, SIMS, RBS, AFM, ...)
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