

Abstract Submitted
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Plasma-Modified Atomic Layer Deposition THOMAS LARRABEE¹, SHARKA PROKES, Naval Research Laboratory — PEALD is known to grow thin films with differing properties from those grown purely via chemical reactions, or thermal ALD processes. However, material properties are still limited when compared to films grown by other deposition techniques. We have used non-growth plasma steps in each ALD cycle to modify properties, in a technique we refer to as plasma-modified ALD. To study how non-growth plasma steps modify properties, we have grown metal oxides with various plasma processing steps from CCPs of Ar, O₂, N₂, and H₂ gases at relatively high pressures of 1-2 mbar. A grid is used to screen ion bombardment of the samples within a commercial Beneq TFS-200 reactor, making this plasma configuration indirect, but not remote. Several properties show significant differences between the films grown with and without these additional steps. These altered properties include crystalline orientation as indicated by XRD, plasmon resonances, photoluminescence, electron paramagnetic resonance, optical dispersion, mobilities, carrier concentrations, and resistivities. Selected plasma-initiated modifications to ALD-grown oxides of zinc, vanadium, and hafnium, and their anticipated applications in novel materials systems will be presented.

¹NRC Postdoc at the Naval Research Laboratory

Thomas Larrabee
Naval Research Laboratory

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