

**Thin-film Electronics by ALD:
Achieving High Performance with Low Process Complexity**

Abstract: Patterning thin-film transistors for “printed electronics” applications can be challenging both for resolution and for alignment accuracy. This is particularly true for high-performance devices with submicron channel lengths, and for diverse and deformable substrates. Printing organic-based devices requires additional consideration of issues such as printing dynamics and orthogonality of solvents. In this talk, I will describe alternative approaches to scalable thin-film electronics based on spatial atomic layer deposition (SALD) of metal oxides. Using the relatively high deposition speed of SALD, the conformality of the deposited layers, and the surface-sensitivity of the technique, we have explored both print-compatible high-performance vertical transistors, and patterned-by-printing circuitry. A reliable ZnO mobility above $10 \text{ cm}^2/\text{Vs}$, on-off ratio above 10^7 , and uniform threshold voltage values across the substrate give these approaches promise for large-area applications.