

**Atomic Layer Deposition for Nanotechnology Fabrication
with Applications in Microelectronics, Biosensors and Microfluidics**

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要旨

Atomic Layer Deposition (ALD) is recognized as a key technology for microelectronics to advance beyond the 45nm device node. This presentation will discuss the vast application potential of ALD that reaches far beyond the mainstream research efforts of developing novel high-k dielectric gate stacks for the replacement of SiO₂ as MOSFET gate insulator. At ODU several research activities are conducted in the areas of ALD thin film nanotechnology, Si nanowire based devices, nano-resonator biosensors and microfluidic devices, even extending ALD to superconducting RF films for accelerator cavities. For Si nanowire based devices we have demonstrated successful integration of ALD high-k dielectric films for the charge trapping layer and blocking oxide layer for non-volatile memory cells with a 3-D gate-all-around electrode. However, the application potential of ALD is not confined to microelectronics and novel high-k dielectric gate stacks. The unique capabilities of ALD to coat complex high aspect ratio surface morphologies render ALD ideal for the synthesis of nested co-axial multiple-walled nanotubes by template replication. This synthesis may be extended to fabricate coaxial tube-in-tube nanostructures of different materials with applications in multi sensors, broad band detectors, nanocapacitors and hybrid photovoltaic cells. Zeta potential modulation by ALD technology for the development of electroosmotic pumps in nanoporous templates is discussed. Our electroosmotic nano-pumps have no moving parts, no wear and tear, and transport fluids with the use of direct current potential differences of a few volts.



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