Programmable Nanofabrication with Direct Atomic Layer Processing (DALP®) for Optics, Microelectronics, Sensors, and Catalysis

Direct Atomic Layer Processing (DALP®) combines atomic layer deposition with localized and programmable material placement. This approach enables thin films to be deposited in selected regions, with control over their thickness, geometry, material sequence, and spatial distribution. It therefore provides an alternative route for fabricating functional structures and integrating materials directly onto device substrates.

This talk will present selected applications of DALP® in optics, microelectronics, sensors, and catalysis. In optical systems, localized thin film deposition can be used to control transmission, reflection, and surface functionality. In microelectronics, DALP® can support the deposition of dielectric, passivation, barrier, and interface layers in defined regions. Sensor applications can benefit from the controlled placement of chemically, electrically, or optically active materials near electrodes and sensing structures. In catalytic systems, localized coatings can be used to define active areas, combine different materials, and engineer surface architectures.

The talk will discuss the use of DALP® for direct patterning, multi-material integration, localized surface modification, and deposition on non-planar substrates. The presented examples will demonstrate how programmable atomic layer processing can support rapid prototyping and device-specific thin film manufacturing.