

## **Approaches, Challenges, and Opportunities for Area-selective ALD**

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The increasingly demanding requirements for patterning films in state-of-the-art semiconductor processing, motivates the development of bottom-up fabrication strategies based on area-selective ALD. In particular, the implementation of area-selective ALD in self-aligned fabrication schemes can reduce the number of lithography steps, and thereby eliminate the challenge of aligning layers with nanometer accuracy.

In this tutorial, an overview will be presented of the approaches that currently exist for achieving area-selective ALD. The patterning of ALD-grown films will be reviewed, in order to describe various area-selective ALD approaches that involve a patterning step. In addition, there will be attention for area-selective ALD on pre-patterned surfaces for self-aligned fabrication, which includes recent efforts based on the surface-dependence of ALD nucleation. The requirements for area-selective ALD processes will be discussed in terms of selectivity, desired thickness, and processing compatibility.