

Atomic and molecular layer processing: Prospects and strategies for selective area atomic layer deposition

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Thin film processing technologies that promise atomic and molecular scale control have received increasing interest in the past several years as traditional methods for fabrication begin to reach their fundamental limits. Atomic layer deposition (ALD) represents the most mature form of atomic and molecular layer processing, and it is used in modern day manufacturing of microelectronic devices, including logic and memory. There are additional opportunities for ALD to contribute that depend on the development of ALD processes that are substrate composition dependent, which exhibit selectivity, i.e., growth on material A, with no growth occurring on material B. Over the past several years a number of groups have been pursuing different approaches to developing selective area ALD processes. In this presentation we will present a short overview of ALD, comparing and contrasting it to other deposition techniques, with an eye on factors that might produce selectivity. We will also present a summary of the work conducted to date on selective area ALD, identifying the strengths and weaknesses of these approaches, and we will identify some of the major challenges that remain to be solved.