



## Atomic Layer Deposition

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## Atomic Layer Deposition (ALD)

In this presentation, the Atomic Layer Deposition (ALD) technique and different tool setups will be explained. The main advantages and limitations of the technique compared to other thin film deposition methods will also be mentioned.

With ALD it is possible to deposit many different materials, e.g. oxides, nitrides and metals, on almost all kinds of the samples including samples with very high aspect ratio structures.

The chemicals used for ALD depositions are called precursors. These can either be liquids, solids or gases, or reactive species generated by a plasma.

ALD depositions take place in cycles, where the precursors react on a sample surface one at a time. In this way, a thin and uniform layer is being deposited monolayer by monolayer everywhere on the sample surface. The reaction is self-limiting, and the thickness of the deposited layer is easily controlled by the number of cycles.

The reaction between reactants and the sample surface can be either thermally driven, or plasma enhanced. In Plasma Enhanced ALD (PEALD), very reactive species generated by a plasma deliver the necessary activation energy for the reaction to take place. This allows an increased choice of materials and precursors, depositions at lower temperatures and good control of film stoichiometry.

Finally, some selected ALD applications will be presented. These include back-end-of-line (BEOL) processing, high-k dielectrics, encapsulation, optical coatings and applications within metamaterials and plasmonics.