

Atomic Layer Deposition (ALD) Principles, benefits, and applications

The **Atomic Layer Deposition (ALD)** technique is a **cyclic** deposition technique based on the **sequential purging** of the **precursors** and **co-reactants** with **self-limiting surface reactions**. The ALD process grows ultra-thin films (< 20 nm) in two half-cycles, sub-monolayer by sub-monolayer (Figure 1).

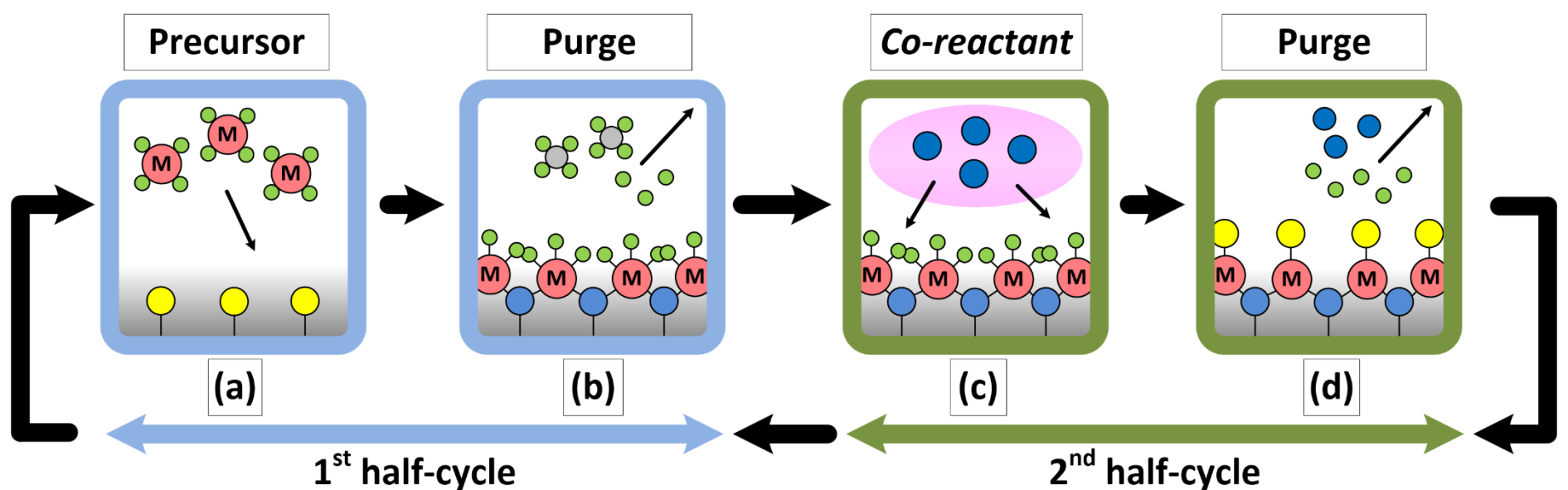


Figure 1 – Representation of an ALD cycle.

The ALD presents **excellent control** over the ultra-thin film thickness and allows complex 3D structures to be covered with a high-aspect-ratio coating (with **high conformality and uniformity**).

The SENTECH ALD system has **excellent thickness precision control** by using an in-situ ellipsometer in **real-time** during the deposition.

Varying the deposition temperature can have a significant effect on the growth and the material properties this study is called the **ALD window** (Figure 2).

The ALD technique can be used in **many applications** by the growth of ultra-thin coatings as:

- The Passivation layers
- Diffusion barrier layers
- Photovoltaic cells
- Coatings of micro-fluidics and MEMS
- Deposition on high aspect ratio structures (Figure 4)
- Deposition on polymers
- Optical coatings (AR layers, optical filters, photonic crystals, waveguides)

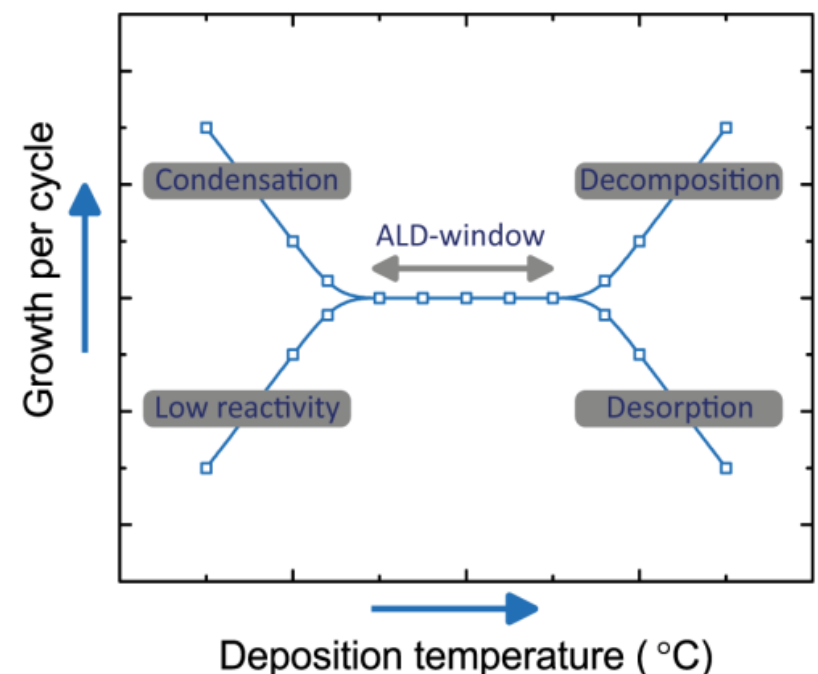


Figure 2 – ALD-window representation.

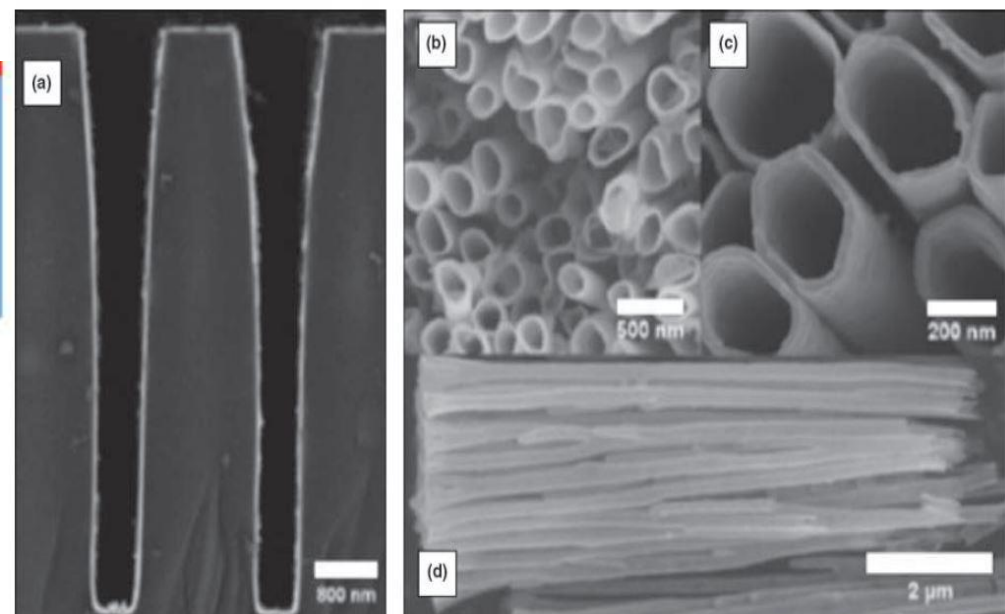
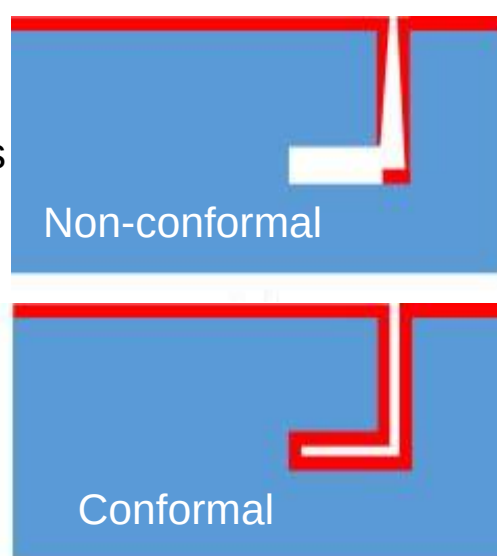


Figure 3 – ALD conformality. Figure 4 – ALD deposition on high aspect ratio structures.