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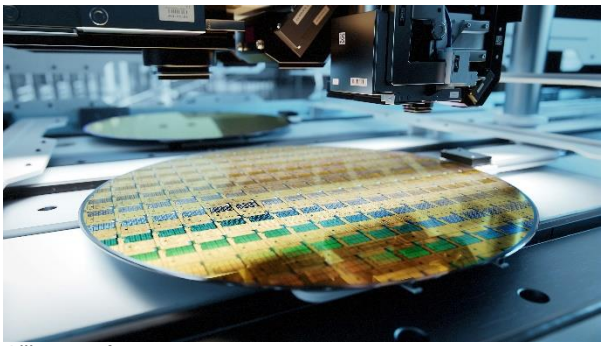
Gas Analysis

Using the HPR-30 to monitor the ALD process



Silicon Wafer

Atomic Layer Deposition (ALD) is a thin film deposition technique used to create ultra-thin films with precise control over the thickness and composition of each layer. ALD is a cyclic process that involves the sequential exposure of a substrate to alternating precursors, which react with the substrate surface to create a monolayer of material. The process is called atomic layer deposition because it operates on a molecular scale, with each cycle depositing a single layer of atoms.

Typically, an ALD process begins by exposing the substrate to a reactive gas or liquid precursor, which chemisorbs onto the substrate surface. The substrate is then purged with an inert gas to remove any unreacted precursor and reaction by-product. Next, a second precursor is introduced, which reacts with the first precursor to form a single layer of material. The substrate is then purged again before repeating the cycle to create additional layers.

ALD can be used to deposit a wide variety of materials, including metals, oxides, nitrides and sulphides, and is often used in the production of thin transistors, solar cells and electronic devices. The ability to precisely control the thickness and composition of each layer makes ALD particularly used for creating complex, multi-layered structures with high accuracy and uniformity.

The Hiden HPR-30 is commonly used in conjunction with ALD processes to monitor and analyse the deposition process in real-time.

In an ALD process the HPR-30 is able to provide high-resolution, accurate measurements of the gas-phase chemistry during the deposition process, allowing researchers to optimize the process conditions and improve the quality and uniformity of the deposited films.

Figure 1 and 2 show normalized data collected using an HPR-30 monitoring an ALD process that uses TMA (trimethylaluminum) as precursor followed by Oxygen plasma.

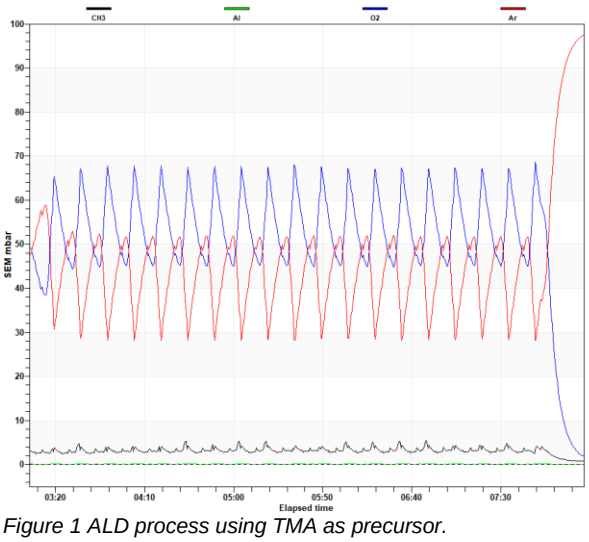


Figure 1 ALD process using TMA as precursor.

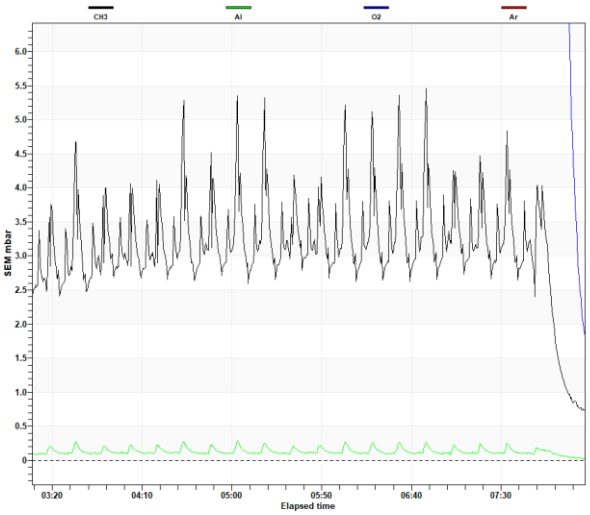


Figure 2 Close-up that shows how the HPR-30 can accurately follow the injection cycles.