

Roll-to-Roll (R2R) Plasma-Enhanced Atomic Layer Deposition (PEALD)

Nano-master introduces an innovative roll-to-roll (R2R) plasma-enhanced atomic layer deposition (PEALD) system designed for the continuous processing of flexible substrates and applicable to inline multilayer ALD coating on glass panels. The system addresses the need for high-throughput, uniform, and conformal thin-film deposition on flexible materials, which is critical for applications such as flexible electronics, displays, barrier coatings and panels. Having the patented Continuous Flow process the individual layer coating modules can be maximally packed allowing simultaneous deposition maximum number of layers in a single pass.

Key components and functionality

- **Roll-to-Roll substrate handling:** The system incorporates a mechanism that continuously feeds flexible substrates through the deposition chamber, enabling large-scale and efficient processing.
- **Plasma generation unit:** uses ECR enhanced Hollow Cathode Source ensuring uniform plasma distribution across the substrate width.
- **Precursor delivery system:** Employs a controlled delivery of chemical precursors in a sequential manner, characteristic of ALD processes, to achieve atomic-level thickness control.
- **Vacuum chamber design:** Features a modular chamber that maintains the required vacuum conditions for PEALD while accommodating the continuous movement of substrates.

Advantages

- **Continuous processing:** The R2R configuration allows for uninterrupted deposition, significantly increasing throughput compared to batch processes.
- **Uniform thin films:** The combination of PEALD with R2R ensures highly uniform and conformal coatings, even on substrates with complex topographies.
- **Scalability:** The system is designed to be scalable for industrial applications, facilitating the mass production of flexible electronic components.
- **Reduced thermal need:** PEALD enables film deposition at lower temperatures, making it suitable for temperature-sensitive flexible substrates.

Applications

This technology is pertinent to industries requiring high-quality thin films on flexible substrates:

- Flexible electronics (e.g., wearable devices, flexible displays)
- Barrier coatings for packaging
- Photovoltaic cells
- Sensors and actuators

