Process Optimization and Uniformity Measurement and Control of Rapid Thermal Annealing Furnaces

Allwin21 Corp.

Semiconductor Rapid Thermal Processor Technical Exchange

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To achieve optimal results in Rapid Thermal Processing (RTP), customers can follow the process below to ensure process stability, consistency, and mass production feasibility:

1. Define Process Objectives and Measurement Metrics

Customers should define the key physical parameters that need to be measured and controlled after RTP treatment, based on their product's technical requirements. Examples include:

- **Sheet Resistance (Rs):** Commonly used to evaluate conductivity after semiconductor metallization or annealing.
- **Power Output (mW) or Voltage Response (mV):** Applicable for optoelectronic and sensor devices.
- **Visual Characteristics:** Such as wafer surface uniformity, color changes, oxide layer thickness, etc.
- **Other Specific Metrics:** Such as carrier mobility, contact resistance, film stress, etc.

2. Establish Parameter Ranges

For each selected physical parameter, customers should define a reasonable target range.

This range can be determined based on past process experience, product yield analysis, simulation results, or technical specifications.

The defined range will serve as the **evaluation criteria** during process development to assess the effectiveness of different RTP process menus.

3. Develop and Optimize Process Recipes Using the "U-Shaped Method"

The "U-Shaped Method" is an optimization strategy based on systematic trial-and-error and gradual convergence.

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Initial process settings may be too high or too low; by observing trends in physical parameter variations, one can progressively converge to the optimal window—represented by the bottom of a “U-shaped curve.”

It is recommended to gradually adjust key parameters such as:

- Temperature setpoints
- Heating ramp rate
- Soak time
- Atmosphere type/flow rate, etc.

4. Define Control Temperature and Alarm Tolerance

Based on the finalized process window, customers should define:

- **Control Temperature** (i.e., the set temperature in the recipe)
- **Alarm Tolerance**, which is used for RTP system alarm detection, lot interception, or process termination.

Conclusion:

To achieve a truly stable and efficient RTP mass production process, customers should center their development around product performance metrics—supported by physical parameter measurement, the U-shaped optimization method, and appropriate monitoring strategies.

We recommend that customers maintain close communication with their equipment supplier throughout process development to ensure that equipment capabilities align with target process parameters.

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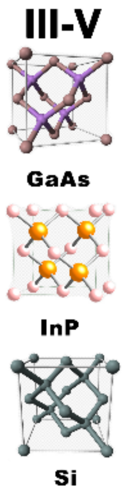

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