CASE STUDY

Enhancing Silicon Carbide Crystal Growth with Precise Temperature Measurement

INDUSTRY	SOLUTION	EQUIPMENT
Semiconductor	Impac® ISR 6 and IGAR 6 Pyrometers	Silicon Carbide Crystal Growth

INDUSTRY BACKGROUND

Silicon carbide (SiC) crystal growth is a critical process in semiconductor manufacturing, requiring tightly controlled conditions to ensure high-quality crystal formation. Temperature measurement plays a pivotal role in this process, as even slight deviations can impact yield, efficiency, and the overall quality of the crystals produced.

CHALLENGE

One of the most significant challenges of SiC crystal growth is the need for precise and repeatable temperature measurement across a broad range, often exceeding 2500°C. The measurement system must offer:

- Absolute and repeatable temperature accuracy throughout extended growth periods (typically 10 to14 days)
- Reliability and long-term stability of the pyrometer device, ensuring consistent monitoring over multiple process cycles
- Capability to monitor and control temperature in different furnace zones (especially top and bottom), which is essential due to variations in the crystal growth procedure and furnace design

SOLUTION

To address these challenges, the customer implemented Impac ISR 6 and IGAR 6 Pyrometers from Advanced Energy.

These advanced temperature measurement devices provide:

- A broad temperature measurement range from 100 to 2550°C
- Exceptional accuracy and long-term stability, ensuring reliable data collection throughout the entire crystal growth process
- Comprehensive process monitoring from the initial heating stage of the reactor or machine
- Special calibration options tailored for critical temperature ranges, particularly between 1800 and 2200°C, which are crucial for SiC crystal growth

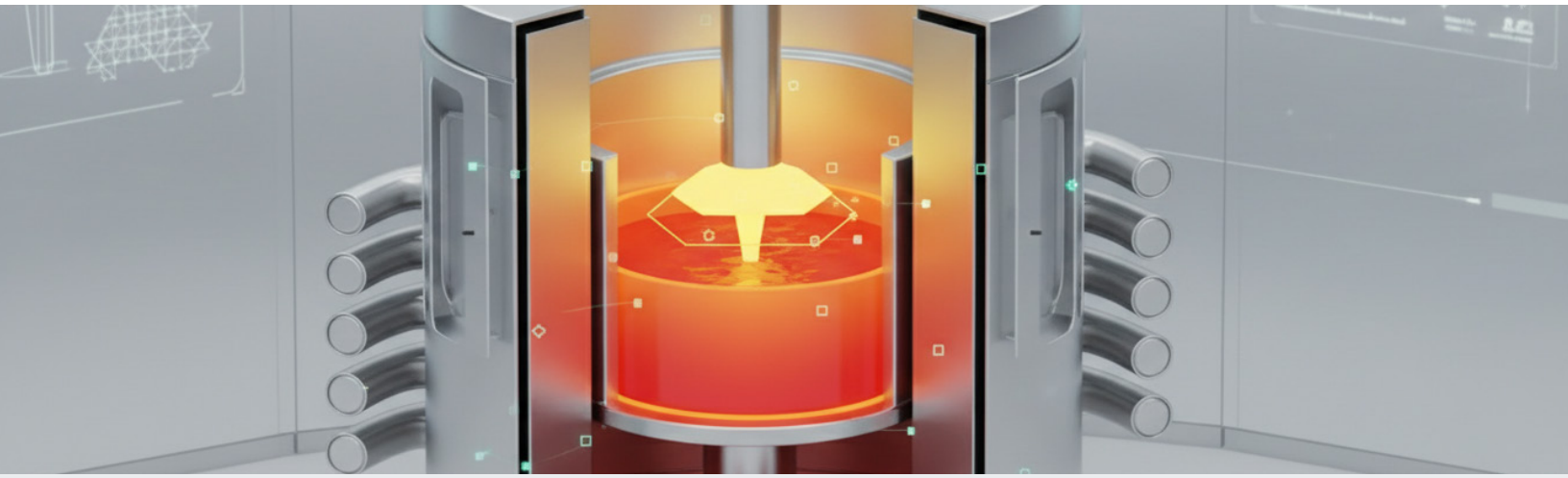
RESULT

By integrating the Impac ISR 6 and IGAR 6 pyrometers, the customer achieved substantial improvements in both efficiency and yield. Key benefits included:

- Consistent, stable, and repeatable temperature measurement led to higher quality crystals and greater process reliability
- Full thermal process control and monitoring throughout the SiC crystal growth furnace, ensuring optimal conditions at all process stages
- Yield optimization, a critical advantage given the lengthy duration of each growth cycle (10 to 14 days)
- Access to AE's superior service and calibration support, allowing for tailored solutions to meet individual process requirements

CONCLUSION

The adoption of advanced optical pyrometry from AE, specifically the Impac ISR 6 and IGAR 6 Pyrometers, transformed the customer's SiC crystal growth process. With precise, reliable, and customizable temperature measurement, they achieved higher yields, better quality, and more efficient operations—making these pyrometers an essential component for any modern crystal growth facility.



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