THERMALAS

Maximize efficiency and precision in material synthesis with THERMALAS - rapid, high-temperature substrate heating technology that simplifies processes and elevates performance.

Features

- Access substrate temperatures up to >2800 °C and rapid ramp rates (400 °C/s)
- Tight PID control with an on-axis pyrometer over a dynamic range of more than 3 orders of magnitude
- Broad compatibility with process gases (O_3, O_2, N_2, NH_3) from UHV to beyond 10^{-2} mbar
- Local heating minimizes outgassing
- Thermal preparation of terminated, growth-ready surfaces in minutes

Class 1 laser safety

- Class 1 qualification: hermetically sealed beam path
- Integrated safety interlock with laser shut-off relay

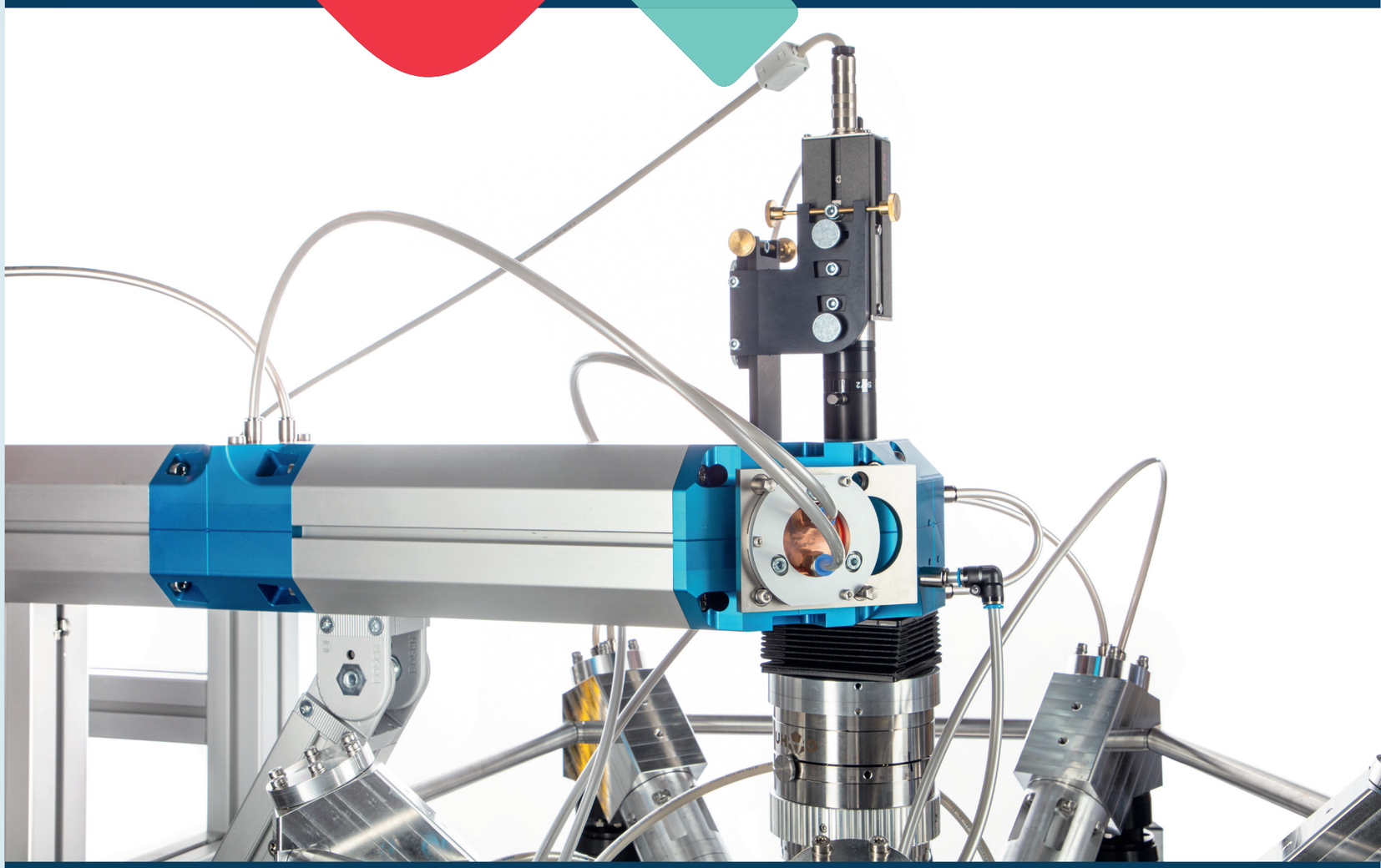
Options

- Available as add-on upgrade for existing epitaxy systems
- Substrate sizes from 5x5 mm^2 up to 4 inch diameter
- Compatible with alternative laser wavelengths
- User-specific configurations available on request

Contact

epiray GmbH
phone: +49 160 1064675
email: info@epiray.de
internet: www.epiray.de

epiray
THERMALAS



Pioneering unrivaled temperatures by laser substrate heating

CLEAN, SIMPLE, FAST & VERSATILE

THERMALAS

Experience the next generation in substrate preparation and epitaxial growth with CO_2 laser heating. Designed to transform your laboratory's throughput and expand your material research horizons.

THERMALAS CO_2 laser substrate heating provides extreme temperatures (>2800 °C) and rapid ramp rates (400 °C/s). Direct absorption of laser energy by the substrates ensures an ultra-clean growth environment even at extreme temperatures. Meanwhile, our proprietary laser optics solution ensures excellent thermal uniformity across the substrate even for larger wafer sizes.

With THERMALAS, substrate heating takes minutes instead of hours. It gives you higher temperatures and faster ramp up/down rates. For low temperatures, it's better than others. For high temperature, it's the only choice.

THERMALAS is compatible with all existing epitaxy technologies and can be readily added to existing systems as an add-on upgrade.

Rapid surface preparation

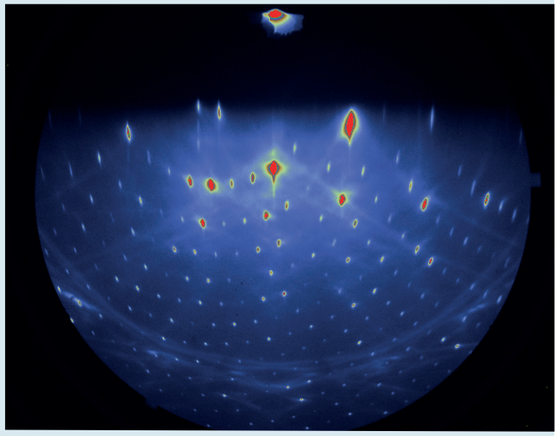
High-temperature annealing in the growth chamber quickly prepares oxide substrate surfaces, eliminating the need for chemical treatments or *ex situ* processes in just minutes.

Minimal outgassing

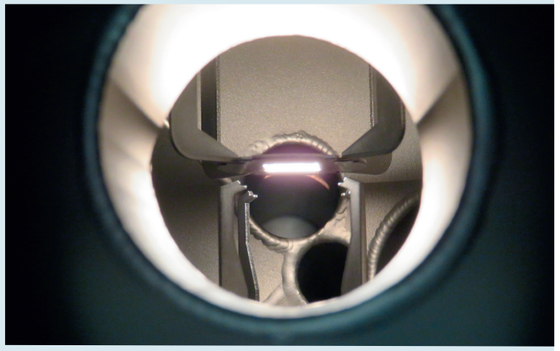
THERMALAS laser energy is absorbed only by the substrate, minimizing parasitic heating to enable ultra-clean epitaxy even at extreme temperatures.

Easy upgrade path

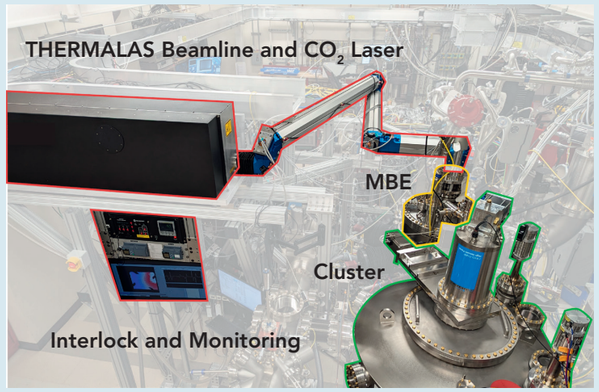
Install THERMALAS as an update to an existing epitaxy system, or use it as a key component in our STRATOLAS TLE system later.



Sapphire surface after thermal preparation at 1700 °C. The observation of 20 Laue circles indicates the high crystal quality of the surface. *Image courtesy of MPI-SSR Solid State Quantum Electronics.*



Sapphire substrate during thermal preparation at 1700 °C. *Image courtesy of MPI-SSR Solid State Quantum Electronics.*



CO_2 laser substrate heating

Ultimate thermal performance

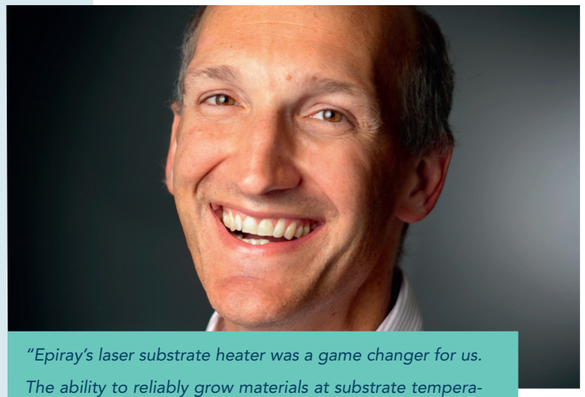
Conventional substrate heating techniques, such as resistive heating, filament heating, quartz lamp heating and infrared laser heating, limit available substrate temperatures to approximately 1000 °C. Furthermore, the substrate heating is indirect so that the substrate is always in contact with contaminants such as backside coatings, metal blocks or pastes.

Epiray's THERMALAS heater offers the ultimate solution to these issues: direct laser substrate heating using a CO_2 laser. Far-infrared CO_2 laser light is well absorbed by almost all oxide substrates and therefore no intermediate heat transfer material is required. The substrate holder always remains much colder than the substrate because the absorption of our laser light by metals is marginal. This allows for epitaxy even at temperatures up to the melting points of most substrates regardless of process environment.

Because of the minimal thermal mass, not only extremely high temperatures but also fast ramp rates and tight temperature control are possible.

Proven performance

Since installation in September 2022, a THERMALAS laser heater has been used to heat the substrate of an MBE in a user facility dedicated to accelerating materials discovery co-directed by Darrell Schlom at Cornell University.



Prof. Darrell Schlom
Cornell University

"Epiray's laser substrate heater was a game changer for us. The ability to reliably grow materials at substrate temperatures up to 2000 °C has unlocked the growth of many materials, allowing us to push boundaries across the periodic table. On the practical side, our throughput also improved due to time savings on substrate preparation and shorter downtime between chamber openings. Lab users have grown over 3000 films with epiray's laser substrate heater since installation."