Southern Research’s Variable Atmosphere Temperature and Pressure (VATP) Facility was built for evaluation of hypersonic vehicle leading-edge materials via mission performance tests in realistic service environments, such as variable temperature, atmosphere, pressure, and load.

**Intended Applications**

- Oxidation exposure of CMCs to as high as 4000 °F (2204 °C) in partial pressures of pure, dry air as low as 10^{-5} Torr with automated, digital control of pressure and temperature.
- Re-entry leading-edge temperature/pressure mission simulation
- Mechanical tests in vacuum and low-pressure air including tensile creep

**Capabilities in Air via Induction Heating**

1. Zirconia: 4200 °F, 50–760 Torr
   Heating rate: as high as 3 °F/sec
2. Iridium: 4000 °F, 10^{-5}–50 Torr
   Heating rate: as high as 10 °F/sec

**Other Capabilities**

1. Quartz Lamp: 2600-3000 °F, 10^{-5} Torr
   Heating rate: as high as 10-30 °F/sec
2. Iridium: 4000 °F, 10^{-5} Torr
   Tensile hardware in development

**Future Capabilities**

- Cryogenic testing to as low as 20 K with a cryo-cooler; utilization of Digital Image Correlation and other non-contact strain methods
- Elevated temperature refractory metal hardware to conduct mechanical tests in vacuum above 2600 °F
Southern Research’s Variable Atmosphere Temperature and Pressure (VATP) Simulation Facility was built for evaluation of hypersonic vehicle leading-edge materials via mission performance tests in realistic service environments, such as variable temperature, atmosphere, pressure, and load.

### Intended Applications
- **Oxidation exposure of CMCs** to as high as 3800 °F (2090 °C) in partial pressures of pure, dry air as low as 3 torr (0.004 atm) with automated, digital control of pressure and temperature.
- **Orbiter leading-edge temperature/pressure mission simulation** via Induction Heating.
  - **Zirconia**: 4350 °F (2400 °C), as low as 43 torr (0.06 atm), heating rate: as high as 2 °F/sec.
  - **Iridium**: 3900 °F (2150 °C), as low as 3 torr (0.004 atm), heating rate: as high as 13 °F/sec.

### Other Capabilities
- **Graphite**: 5500 °F (3000 °C), Inert Environment, heating rate: as high as 13 °F/sec.

### Future Capabilities
- Automated load control and set-up for tensile testing in simulated environments.
- Lower pressure capability at current temperatures.

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**Figure 1**: Temperature of CMCS vs. optical pyrometry and 2-color and 3-color fiber-optic pyrometry and chamber pressure as a function of elapsed time in Southern’s VATP Facility.