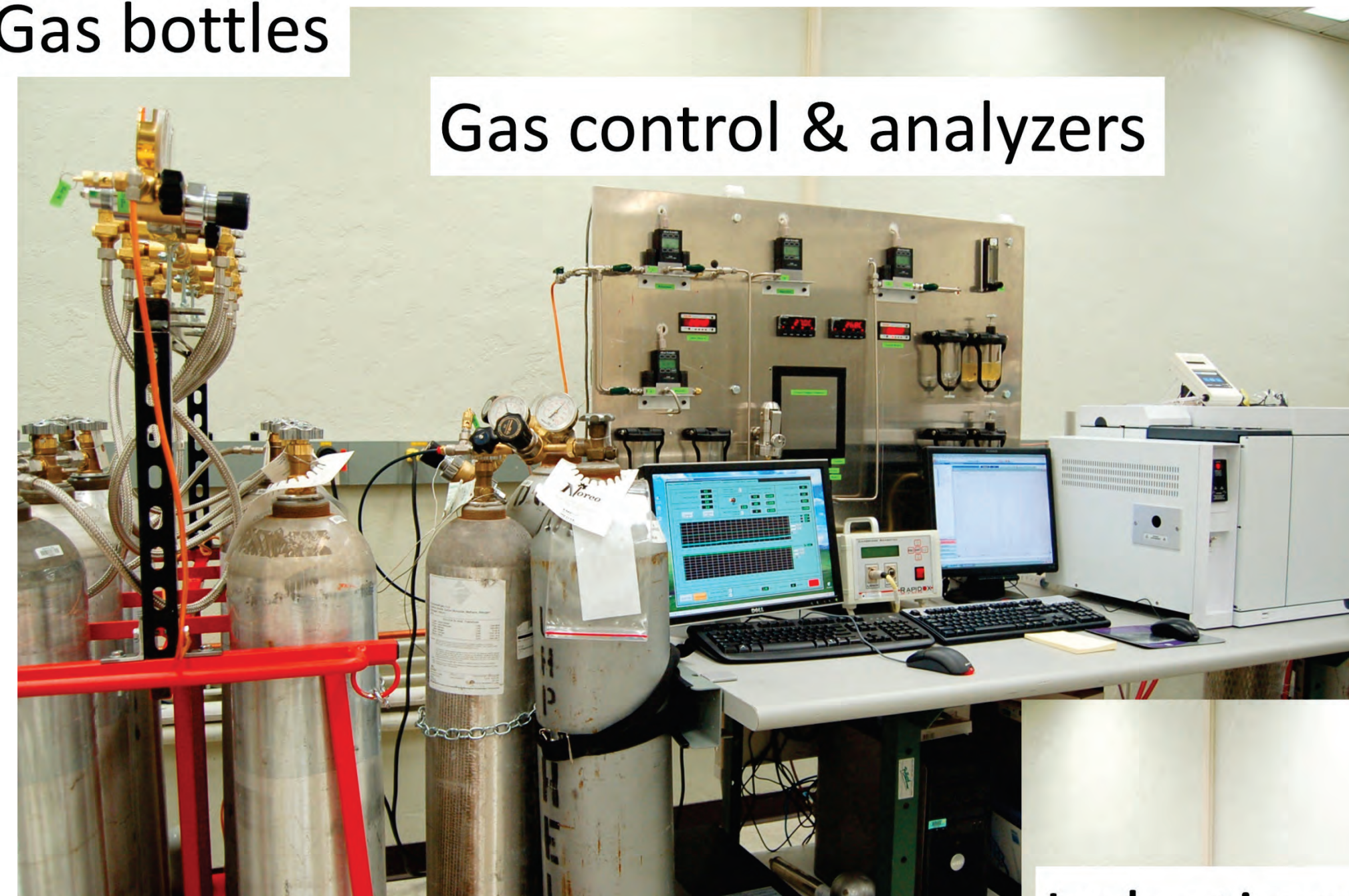


# Fracture Mechanics in Highly Controlled Environments

- Elevated temperature static exposures and cyclic and crack growth testing in applicable environments
- Evaluation of degradation and failure mechanisms under exacting conditions

## Creep-fatigue, fatigue, and stress relaxation

### Gas bottles

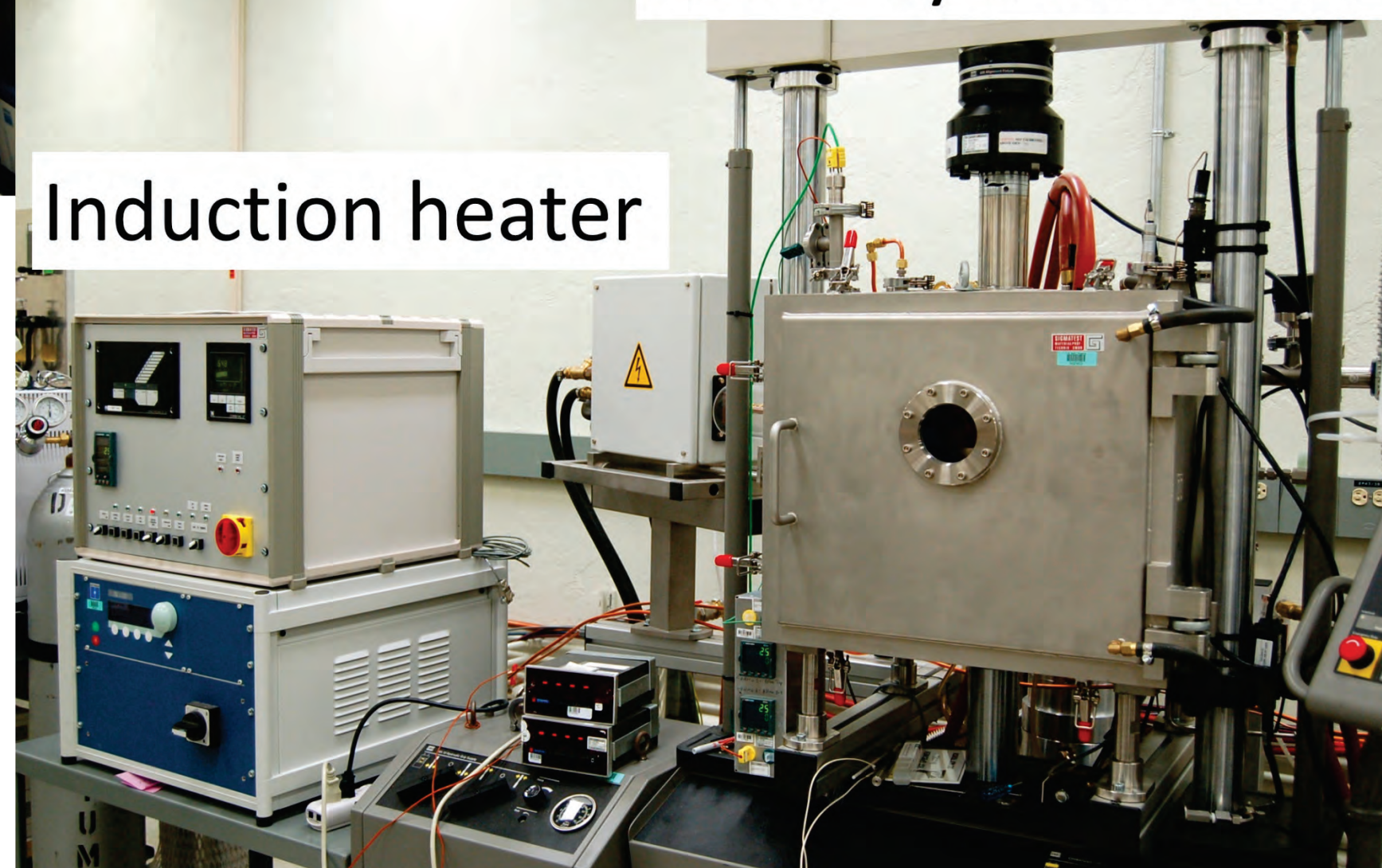


Gas control & analyzers

### Servo-hydraulic controlled environment

Fatigue, creep-fatigue and stress relaxation up to 1000 °C in a specified environment with a partial pressure of water as low as 5 ppm

### Servo-hydraulic frame

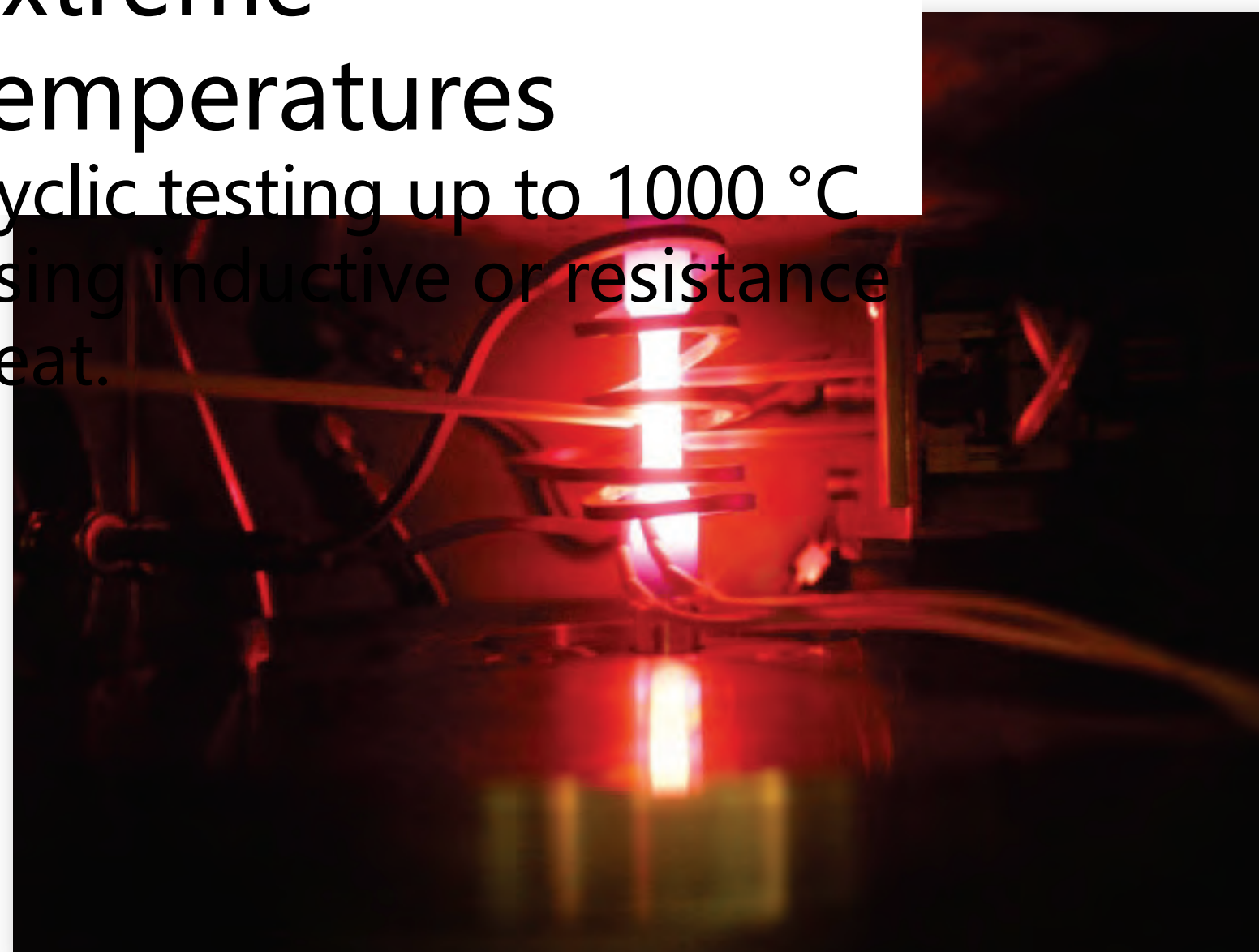


Induction heater

An integrated gas delivery system and mechanical test system equipped with gas-tight chamber. Mass flow and pressure controllers regulate the gas flow and pressure, respectively.

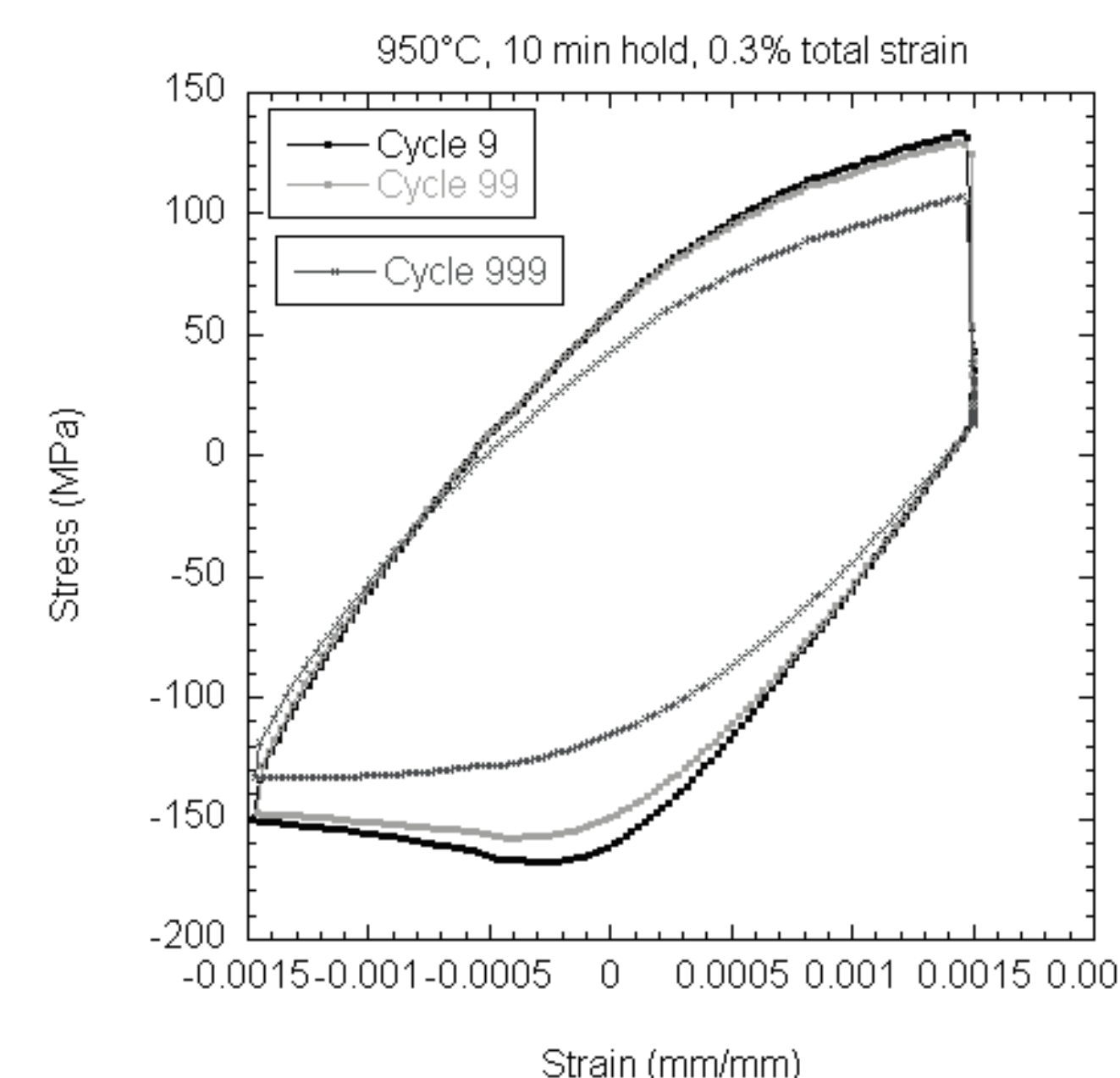
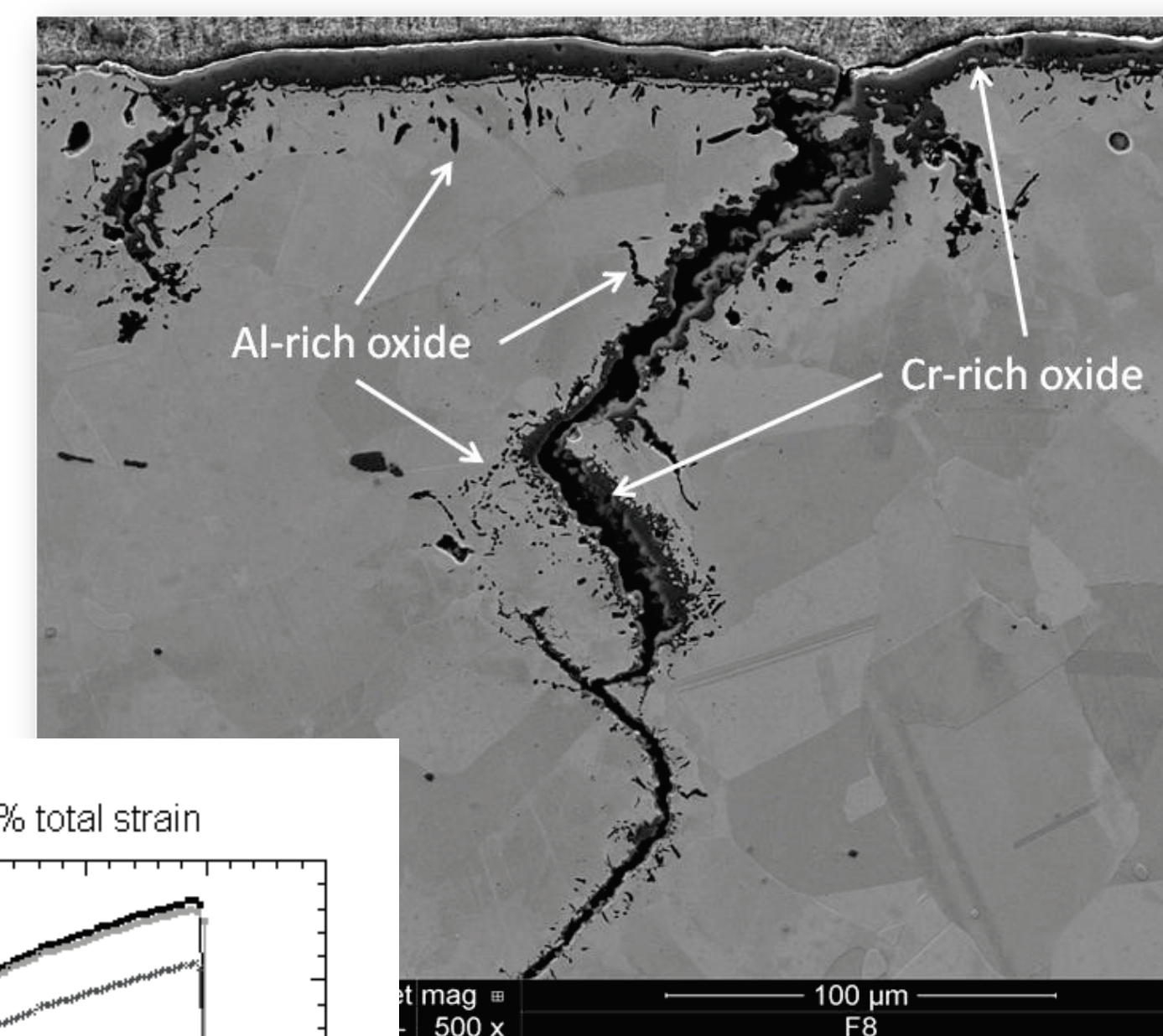
### Extreme temperatures

Cyclic testing up to 1000 °C using inductive or resistance heat.



### Characterization

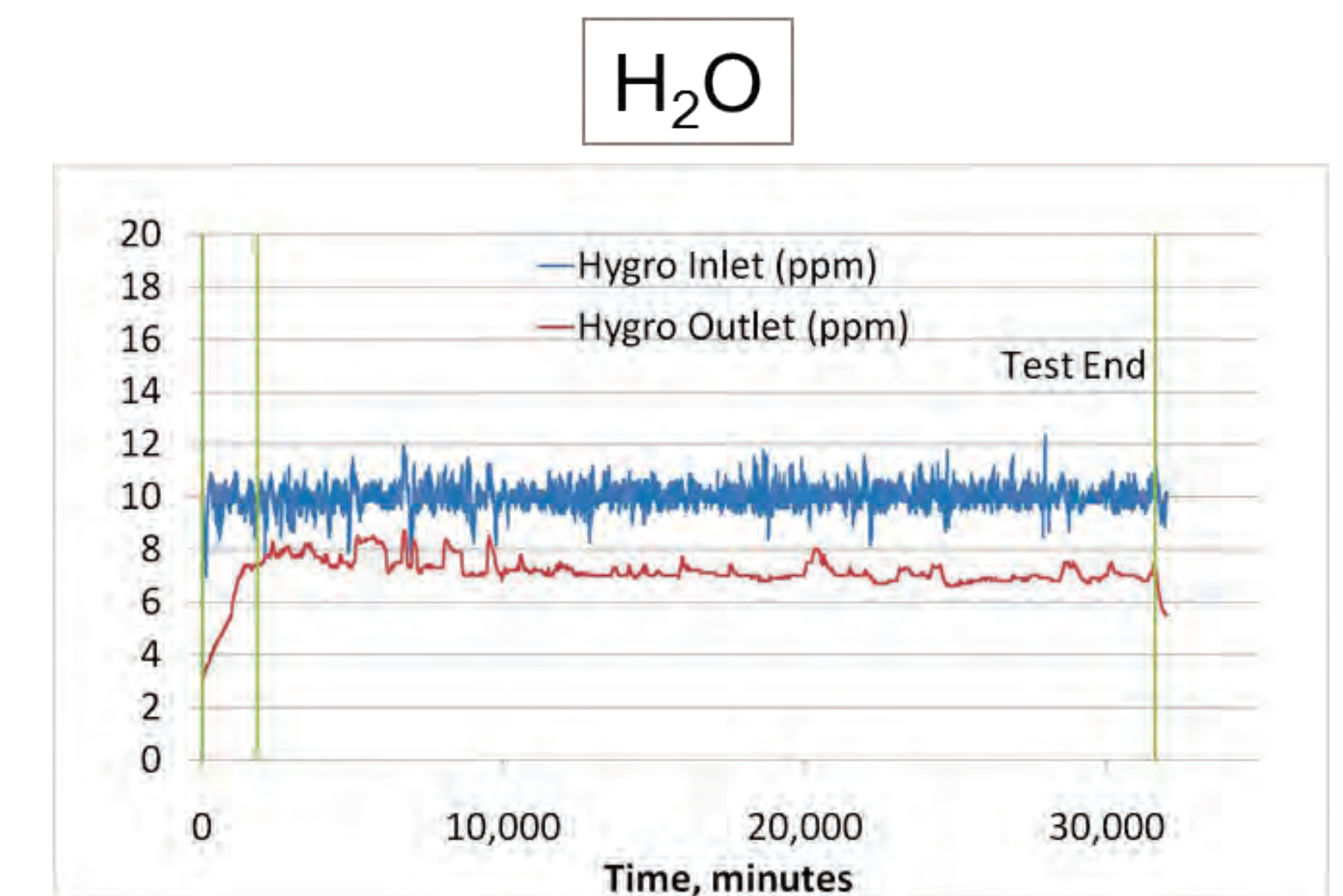
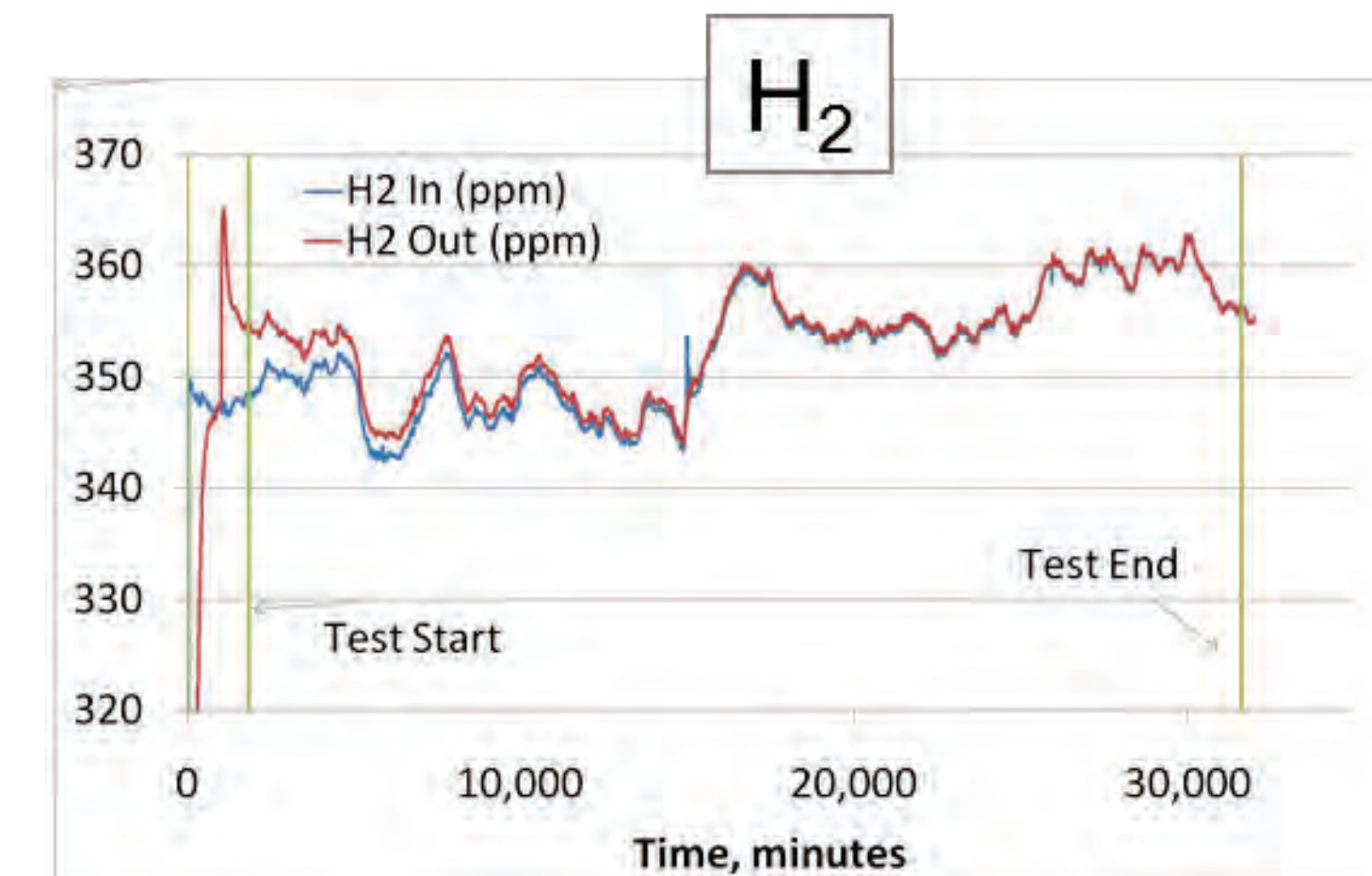
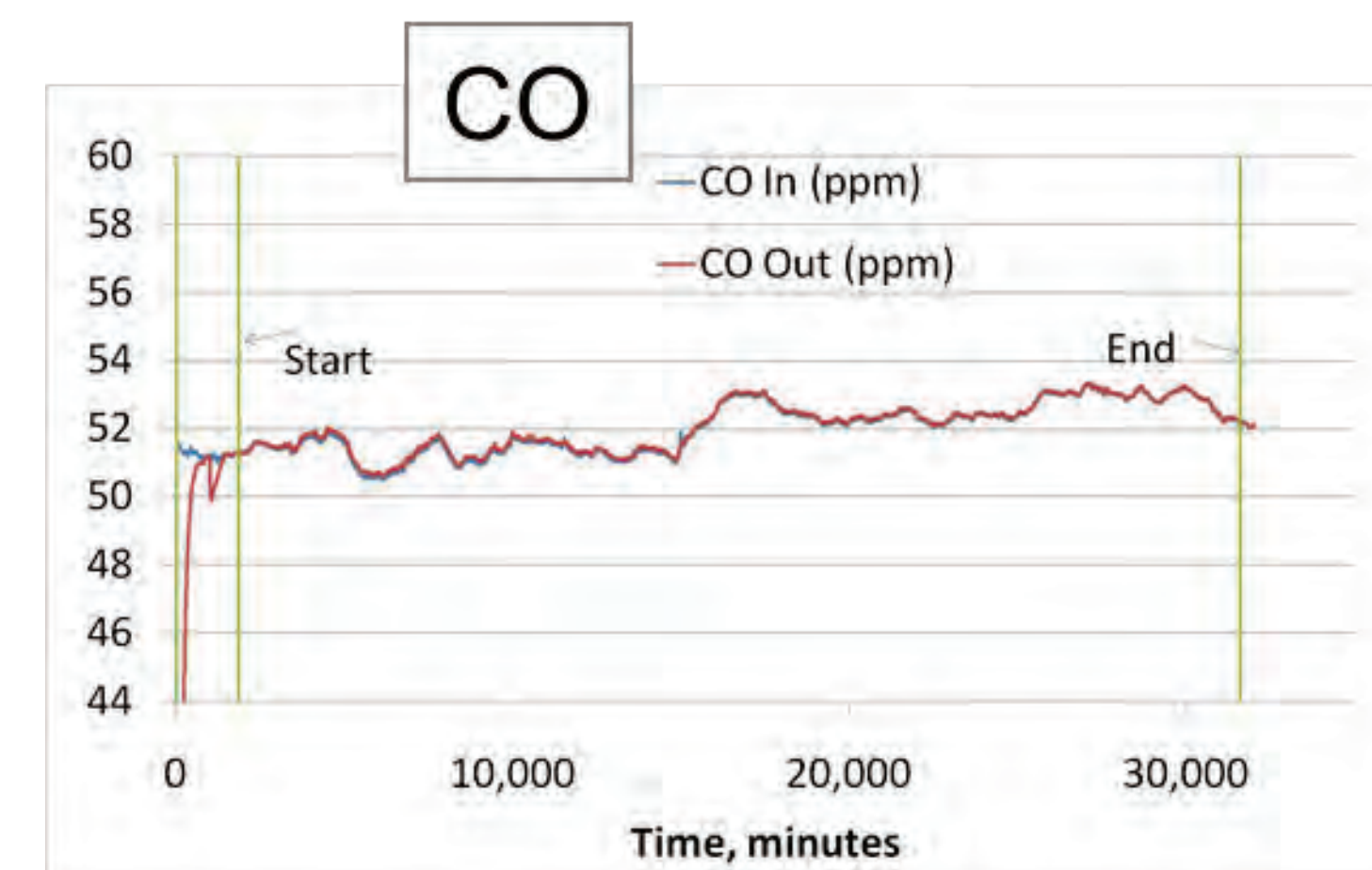
SEM image of an oxidized surface crack formed during creep-fatigue deformation of a nickel alloy at 950 °C.



### Data collection

Hysteresis loop of from several strain-controlled creep-fatigue cycles of a nickel alloy at 950 °C.

## Continuous monitoring of the environment chemistry

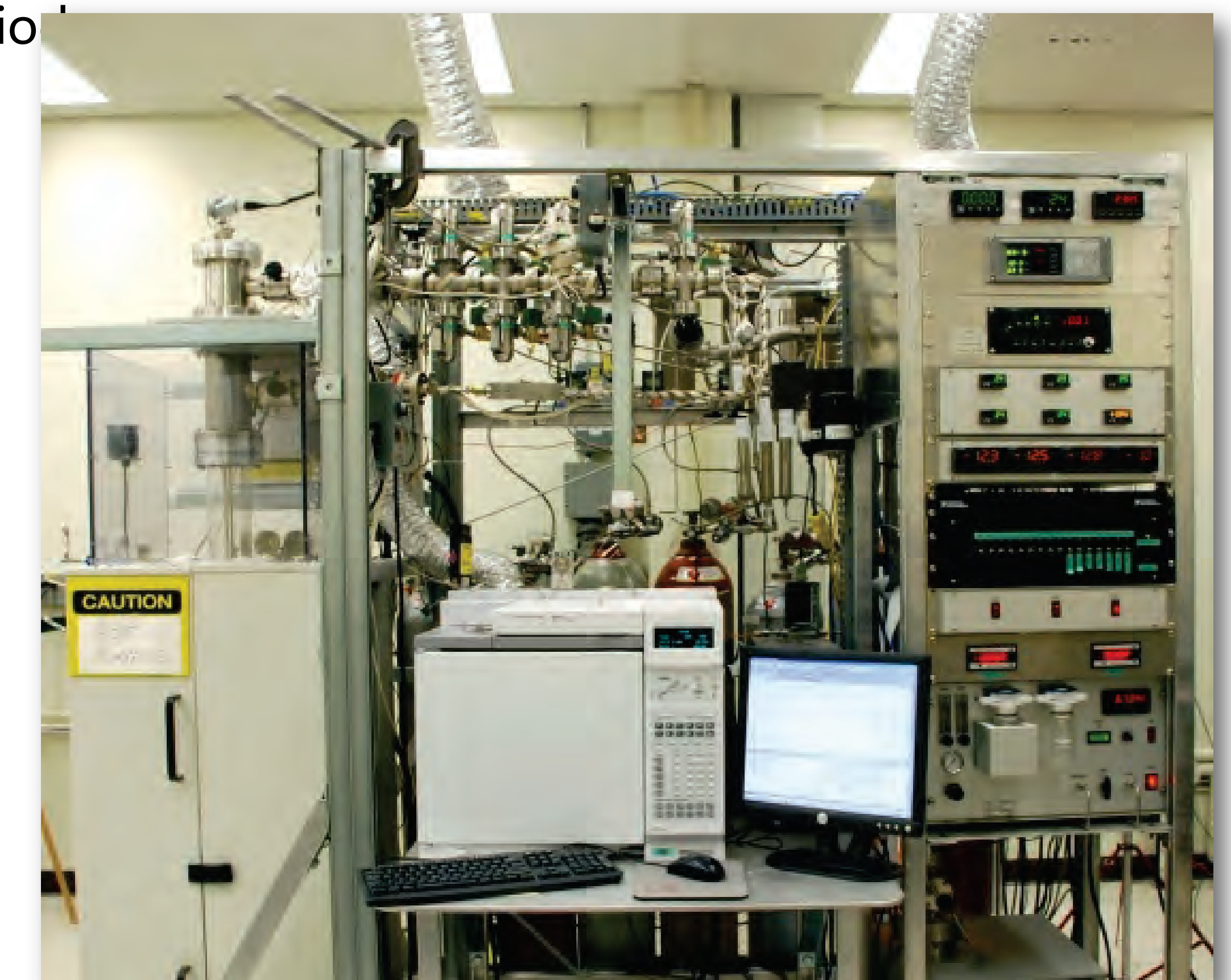


### Load frame gas chemistry control

The gas delivery system combined with a gas chromatograph and two solid-state hygrometers allows precise analysis of the test environment and feedback control of the water level

## Static Exposures in Specified Chemistry

The ability to mix gas chemistry in a flow loop and enable to exposure to highly-controlled environments for extended periods



### Contact

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### Research Rigor

NQA-1:2008/2009a integral to the culture for advanced testing.