



Kratos SRE has been a national leader in the thermal properties characterization and evaluation of high temperature materials for more than 55 years. The staff of the Thermal Properties Laboratory have performed tests on a variety of materials including composites, ceramics, metals, insulations, and lubricants under normal and in extreme environments at temperatures from cryogenic to over 5500°F.



■ **Thermal Expansion**

- NBS quartz tube dilatometer (-320 to 2000°F, vacuum, pressure, air, inert)
- Horizontal quartz rod dilatometer (-450 to 2000°F, air, inert)
- Graphite tube dilatometer (RT to 5500°F, vacuum, pressure, inert)
- Cryogenic ring (-320 to 250°F, inert)
- High-temperature ring (RT to 5000°F, inert)
- Yarn/filament/fiber (RT to 5000°F, air, inert)

■ **Thermal Conductivity**

- ASTM C177 guarded hot plate (-360 to 600°F, vacuum, load, air, inert)
- Comparative rod apparatus (-350 to 2000°F, vacuum, load, air, inert)
- Radial inflow apparatus (1500 to 5000°F, vacuum, load, inert)
- Pressure radial inflow apparatus (70 to 800°F, up to 5000 psi atmosphere)

■ **Heat Capacity**

- Adiabatic Calorimeter (-450 to 1000°F, Air, Inert)
- Ice Calorimeter (1500 to 5000°F, Inert)
 - › Also see DSC

■ **Yarn/Fiber Properties**

- Creep (RT-5000°F, air, inert)
- Stress rupture (RT-5000°F, air, inert)

■ **Specialty Thermal Testing**

- Total normal emittance (1500 to 5000°F, inert)
- Thermogravimetric analyzer (TGA) (25 to 1200°C, air, inert, vacuum)
 - › Ballistic heating (>2000°C/min)
 - › Modulated mode
- Laser diffusivity (RT to 2100°F, vacuum)
- Heat-treatment furnaces (to 5750°F)
- Differential scanning calorimetry (DSC)
 - › Standard mode (-90 to 725°C, air, inert)
 - › Modulated mode (-90 to 725°C, air, inert)
 - › High-temperature (40 to 1250°C, air, inert, vacuum)

■ **Electrical Resistivity**

- High-temperature coupon (RT to 5000°F)
- RT yarn/filament facility
- High-temperature yarn/filament (RT 5000°F)

■ **Precision Cryogenic Thermal Expansion**

Kratos SRE has developed a unique facility for measuring thermal expansion with ultra-high accuracy from 300 K to below 30 K. Using interferometers and a proprietary optical flagging system, CTE accuracy of better than 20 parts-per-billion is standard. For materials that do not tend to bend or flex, CTE accuracy of better than 10 parts-per-billion is possible (based on 8-inch sample with 20 K delta T). Sample sizes can range from 1 cm to 1 meter.



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