



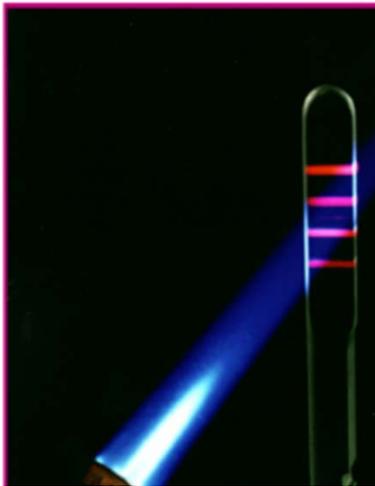
Fluorescent Coatings for Turbine Engine and Thermal Barrier Coat Diagnostics

Phosphor emission indicates temperature and coating health

Technology utilizes certain ceramic phosphors

ORNL has extensive experience in selecting and applying thermographic phosphors to measure surface temperature in challenging hot environments. Blades and vanes in turbine engines are often coated with ceramic thermal barrier coats. Phosphors, being similar refractory materials to the coatings, can be applied to the surface or mixed into the coating material itself. The phosphor method of temperature measurement has many advantages over traditional thermocouples and pyrometric sensing.

- Phosphor thermometry is non-contact
- It makes absolute temperature measurements, not dependent on reference measurements
 - It is independent of surface emissivity
 - It can measure with 1% accuracy, or better if required
 - It can be used for the whole range of about 4 K to about 2000 K



The method involves stimulating fluorescence of the phosphor surface by LED, laser diode, or other laser sources, and recording the fluorescence signal as a function of time. Fluorescence lifetime and various emission line ratios show temperature dependence, each band often covering hundreds of degrees of useful range.

ORNL has more than twenty years experience in applying phosphor thermometry in turbine engine and similar environments. Many of the measurement methods involving these materials were pioneered at ORNL.

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Fluorescent/Phosphor Sensors

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