

Ultraviolet Tensile Testing System



Technical Challenge

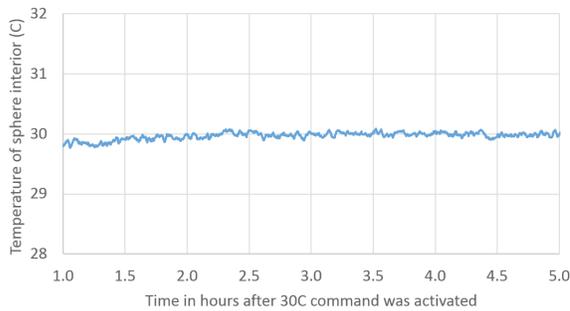
Certain materials testing procedures require putting a sample under extreme conditions or great stress to simulate any situation the material might be in. Exposing a material to high amounts of UV light for a short period can represent the effects of prolonged exposure to the sun. Labsphere was asked for a system that can subject numerous samples to tension and extreme UV irradiance within a controlled environment.

Labsphere's Solution

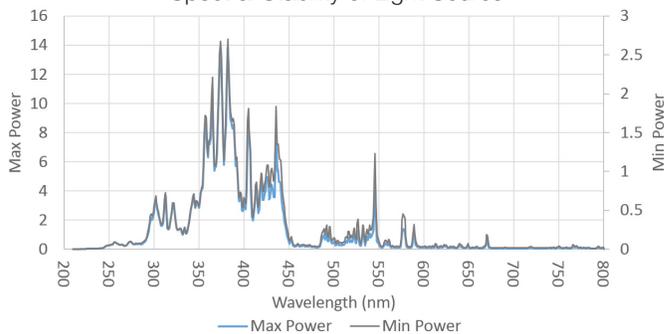
Incorporating a tensile testing system into an integrating sphere environment requires a delicate reworking of the standard geometry. The sphere was built in the shape of a pill, with two hemispheres and a cylindrical tensile testing assembly between them. With careful baffling and other unique features, the system still guarantees reliable test results:

- Eight sample holders each with individual load cell assemblies
- Rollers on each hemisphere for easy exchange of samples between tests
- UV light source capable of outputting irradiance equivalent to thirteen suns and continuously adjusting down to 20% of its full power
- Industrial blower and duct to prevent the light source from overheating
- Environmental control unit for setting the temperature within the sphere
- Sensors installed across the system for measuring oxygen levels, temperature, humidity, and irradiance within the sphere, and tension in each cell
- Custom software optimized for this application and system

Temperature Stability at Full Power



Spectral Stability of Light Source



Benefits

- Multiple safety features ensure that no accidental exposure to the UV rays or extreme temperatures occur during or after testing.
- The light source amply provides enough spectral radiance to meet the client's specifications, and its continuous adjustability makes a variety of testing environments possible.
- Temperature control is accurate and stable, with only $\pm 2^{\circ}\text{C}$ between samples and $\pm .2^{\circ}\text{C}$ overall temperature over four hours.
- With eight sample holders, the testing process is highly efficient.
- The software provides active monitoring of every sensor and individual control over each load cell, including sinusoidal and pull-hold-relax functions.
- The oxygen and humidity sensors provide additional information on the testing environment and give the client the option to incorporate oxygen and humidity controlling units in the future.
- Full test reports were provided, including temperature control, software operation, load cell control, and irradiance calibration and stability.