

FAA William J. Hughes Technical Center

Chemistry and Materials Sciences Laboratory, Building 277

In the Chemistry and Materials Sciences Laboratory (C&MSL), research, development, and testing of new, more fire-resistant materials are conducted using state-of-the-art laboratory equipment for thermal analysis, combustion calorimetry, fire calorimetry, spectroscopy, rheology, surface chemistry, microscopy, and multiaxial mechanical testing.

The goal of this research is to eliminate cabin materials as a cause of fire fatalities in aircraft accidents.

Composite samples up to 0.5 x 0.5 meter can be fabricated in a heated 50-ton press at temperatures up to 1000°F (540°C) or cured without pressure (free-standing) to 800°F (427°C). The C&MSL facility contains the following test equipment.

Analytical Chemistry

- Perkin Elmer System 7 Thermogravimetric Analyzer and Differential Scanning Calorimeter
- Nicolet Magna 550 Fourier Transform Infrared Spectrometer with a Brill cell, CDS Analytical Pyroprobe 2000 for pyrolysis gas analysis, and a total internal reflectance cell for thick solids
- Dionex DX 500 Ion Chromatograph
- Rame-Hart Contact Angle Goniometer used for surface chemistry measurements



Mechanics

- Rheometrics RDA-II Dynamic Analyzer used for rheological testing of fluids and solids
- Instron Model 1125 Universal Mechanical Testing Machine

Sample Fabrication

- PHI Heated Laminating Press with a 50-ton and 1000°F capability
- Gruenberg Curing Oven with an 800°F (426°C) capability

Fire and Combustion Testing

- Parr Oxygen Bomb Calorimeter used for heat of combustion determinations
- Pyrolysis-Combustion Flow Calorimeter (U.S. Patent 5,981,290 to DOT)
- Atas Scientific Cone Calorimeter used to measure the flaming combustion parameters of materials
- Ohio State University Rate of Heat Release Apparatus with oxygen consumption and radiant energy measurement capability



The microscale combustion calorimeter, a unique instrument that was developed by Federal Aviation Administration researchers, is located in the C&MSL. The calorimeter is used to measure the flammability parameters of milligram polymer (plastic) samples under conditions that approximate aircraft cabin fires. The tests performed using the calorimeter provide a quantitative measure of the fire hazard of new materials in an aircraft cabin fire when only research quantities are available, thus saving the expense of manufacturing and testing large quantities of new materials.

In addition, the C&MSL provides the facilities and equipment to quantify toxic gases produced during full-scale fire tests and laboratory experiments. This capability supports the Aircraft Fire and Cabin Safety Research Project.

To find out more about the Chemistry and Materials Sciences Laboratory, contact:

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