



## **MATERIALS COMPATIBILITY WITH AEROSPACE FLUIDS**

### **SUMMARY**

The evaluation of materials compatibility with aerospace propellants at White Sands Test Facility (WSTF) uses immersion testing, isothermal microcalorimetry, and accelerating rate calorimetry to determine the reactivity of a material with a propellant. Immersion testing can be performed at specified use temperatures or the standard temperatures of 25 and 71 °C (298 and 344 K) followed by posttest analysis of the fluid and material. Material degradation may be evaluated using mechanical testing, surface analysis, or optical and electron microscopy. Isothermal microcalorimetry is used to measure minute amounts of heat generated from reactions between the material and fluid. Microcalorimetry can measure as little as 10 microwatts of heat and is especially useful in determining the reactivity of materials with fluids at near-ambient temperatures 25 to 55 °C (298 to 328 K). Accelerating rate calorimetry measures the temperature increase in an adiabatic system as a result of an exothermic reaction. The activation parameters are then derived. The accelerating rate calorimeter operates in the range of 100 to 350 °C (373 to 623 K).

### **TEST RESULTS**

The materials compatibility testing can provide data on the mechanical properties of the material before and after testing, the reactivity of the material and fluid, and any changes in the fluid composition.

### **TEST SAMPLES**

The sample size requirements vary by technique; however, a wide variety of sample sizes can be accommodated.

### **TEST CAPABILITIES**

Immersion tests can be performed in hydrazine, monomethylhydrazine, nitrogen tetroxide, ammonia, and gaseous oxygen. Microcalorimetry and accelerating rate calorimetry are used for testing materials in hydrazine and monomethylhydrazine.

### **CONTACT**

Miguel J. Maes, NASA White Sands Test Facility, Project Manager  
[miguel.j.maes@nasa.gov](mailto:miguel.j.maes@nasa.gov), (575) 524-5677

Jim Williams, NASA White Sands Test Facility, Project Manager  
[james.h.williams@nasa.gov](mailto:james.h.williams@nasa.gov), (575) 524-5543

Susana Tapia Harper, NASA White Sands Test Facility, Project Manager  
[susana.a.harper@nasa.gov](mailto:susana.a.harper@nasa.gov), (575) 524-5418

