

DEVELOPMENT OF TESTING METHODS FOR THERMAL PROTECTION
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Three test facilities at Sandia National Laboratories used for the evaluation of thermal protection systems (TPS) will be presented. The first test facility used is an oxyacetylene torch, set-up following ASTM E 285-80, "Oxyacetylene Ablation Testing of Thermal Insulation Materials." This test is used as a screening method to evaluate the at temperature failures of TPS materials. The flow of the oxidizing flame can be controlled and is capable of reaching maximum temperatures in excess of 2000 °C. The second test is an at temperature oxidation test in a box furnace equipped with an optical dimension measuring device and mass balance for in-situ monitoring of the coated C/C composites up to ~1750 °C. This furnace allows for the direct observational changes in dimension to the composite in addition to changes in mass with increasing temperature. The third test uses the solar furnace that has a controlled high heat-flux, 150-400 Wcm⁻², at the National Solar Power Testing Facility. Temperatures in excess of 1800 °C and high heat flux profiles can be designed and controlled during testing as opposed to the first two testing methods. All three methods will be discussed in greater detail with the goal of creating an understanding of the chemical and mechanical interactions for protective and ablative coatings on C/C composites. Examples of each TPS material tested will also be presented.

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