

BENCH SCALE FIRE TESTING AT THE FEDERAL AVIATION ADMINISTRATION

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An Ohio State University fire calorimeter conforming to FAR 25.853(a-1) Heat Release Rate Test for Aircraft Cabin Materials has been instrumented to measure smoke density and heat release using oxygen depletion. The total heat of flaming combustion is calculated using wall temperature measurements in conjunction with the thermopile and results are compared with oxygen consumption calorimetry. Partitioning of the flaming heat release rate of materials into convective and radiative components is now possible using the method described herein. Data obtained on the modified OSU is compared to data for the same materials measured on a cone calorimeter to show the importance of ignition conditions and sample orientation on the resulting heat release rates.

The FAA has also developed a unique extractive FTIR system to analyze rapidly changing moist fire gas concentrations as a function of time. The path length, cell volume, sample flowrate and system temperature were optimized to provide a rapid response and a sufficient dynamic range to detect gas concentrations generated in the cone calorimeter. A nonlinear classical least squares method was developed to analyze the FTIR data and generate the concentration histories and confidence limits of 16 fire gases. Results of the technique will be presented for flaming and nonflaming combustion tests of polymers and composites.