The Correlation of Heat Release Calorimetry Measurements

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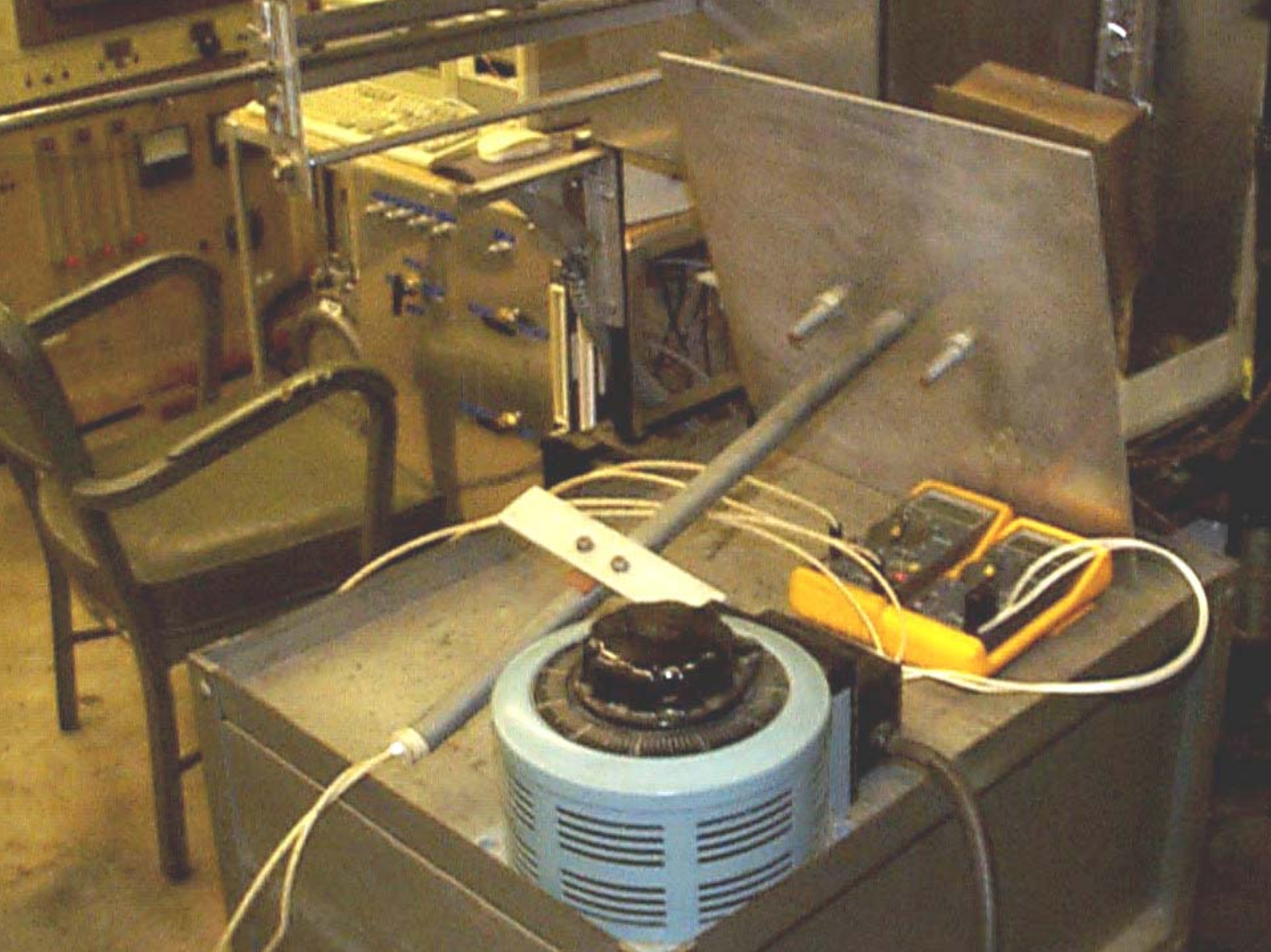
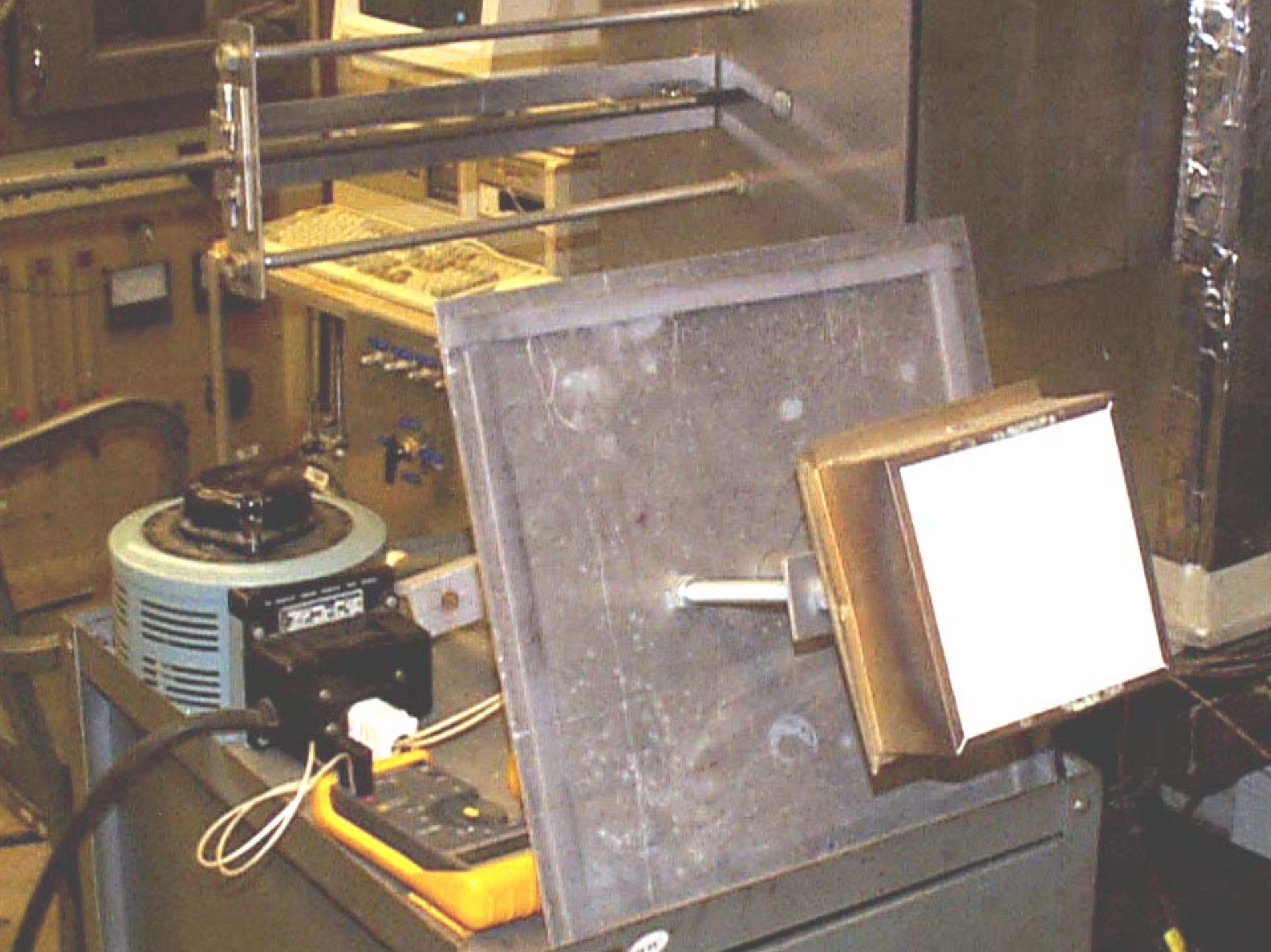
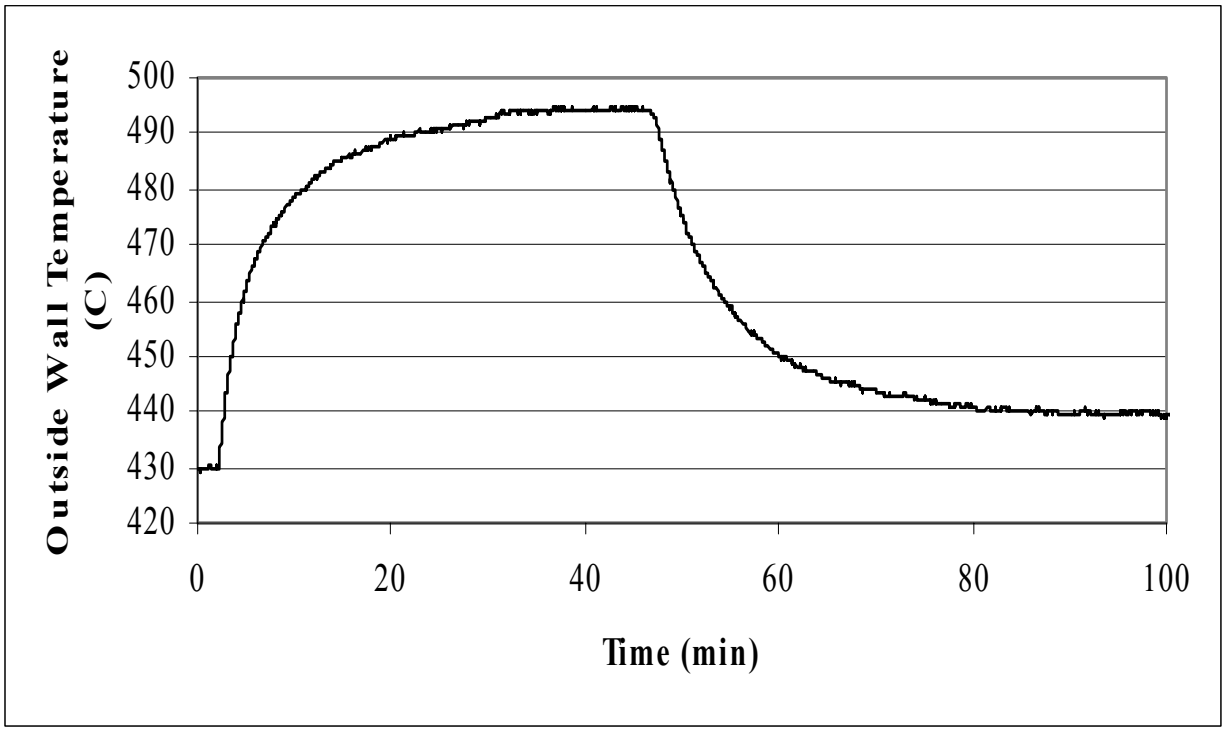
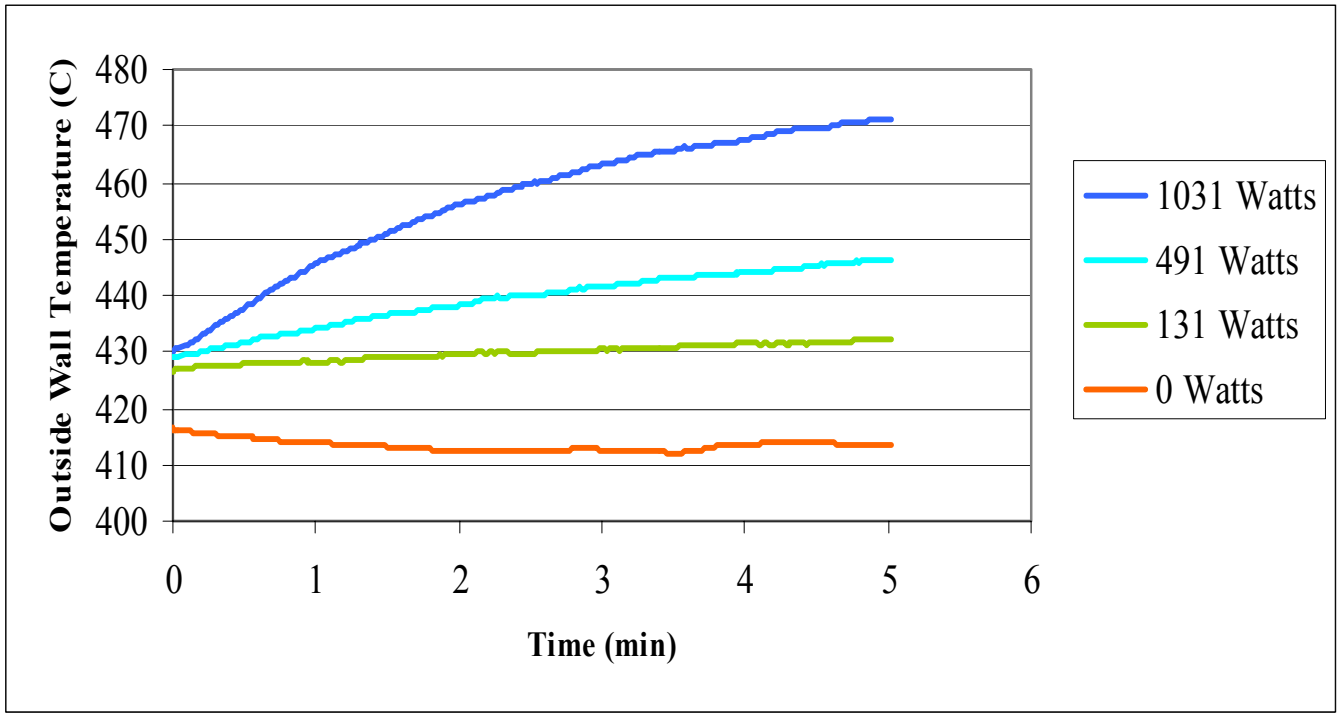




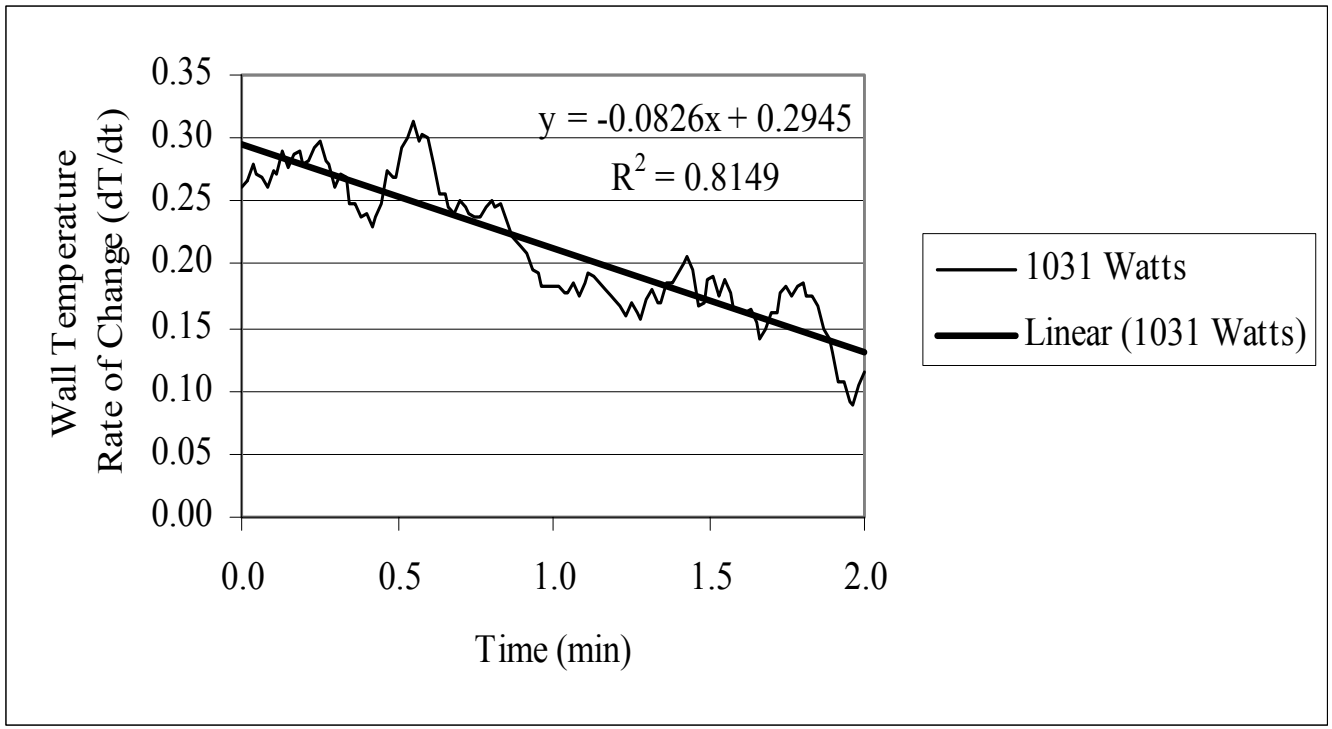
Radiant Panel Test - 1031 Watts



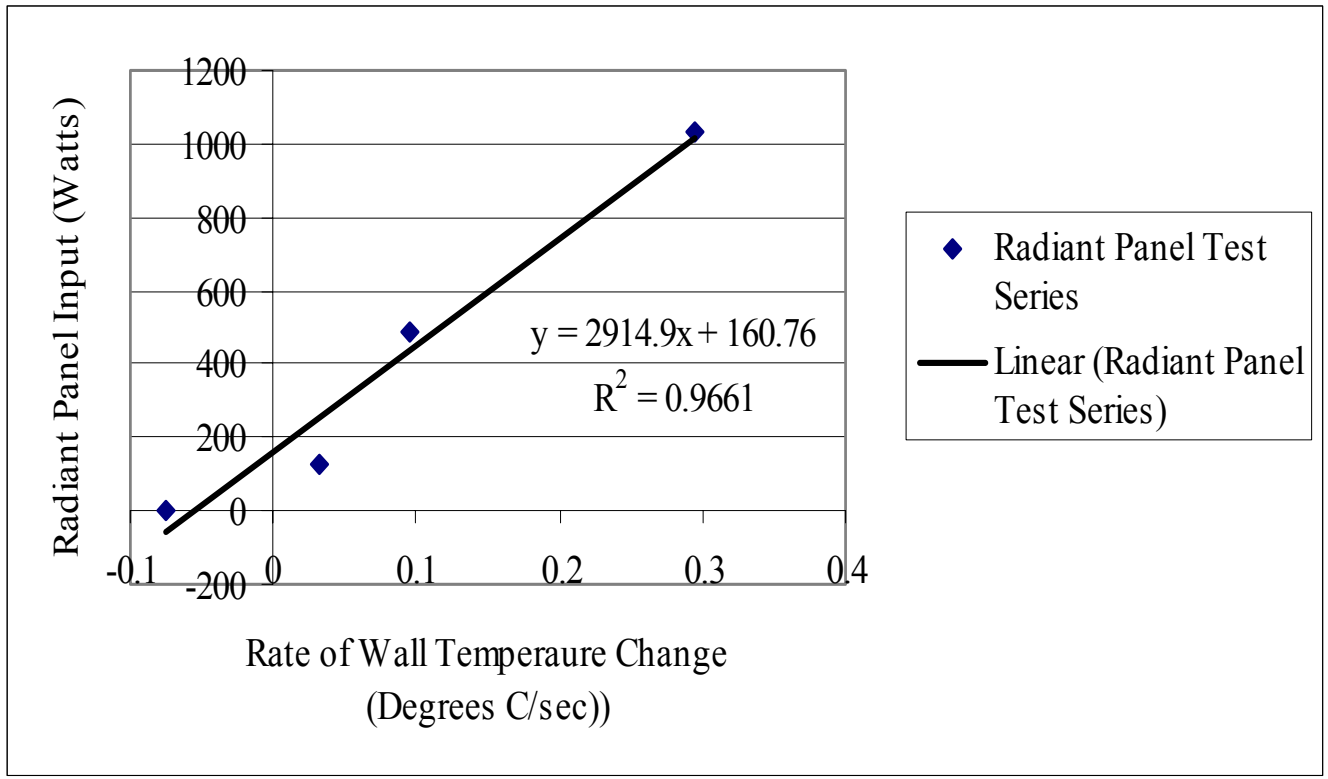
Radiant Panel Test Series



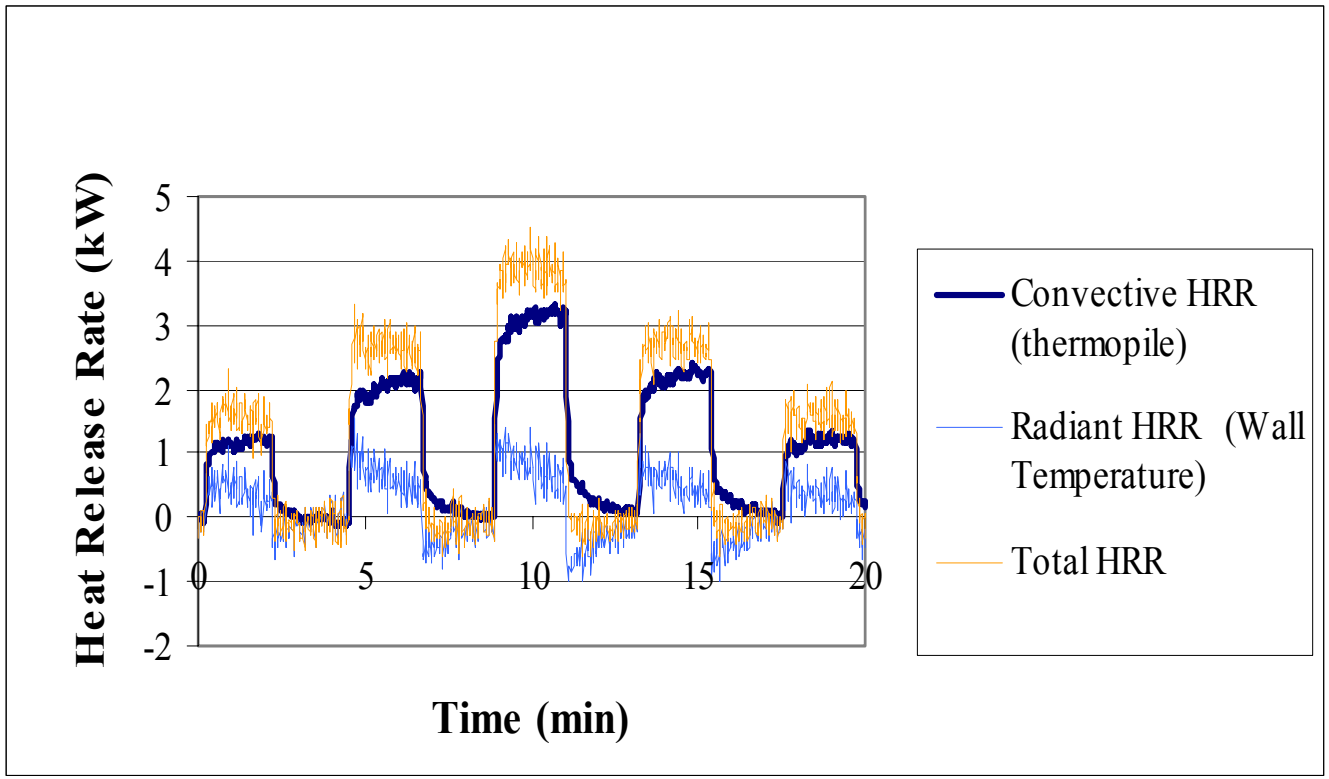
Wall Temperature Rate of Change



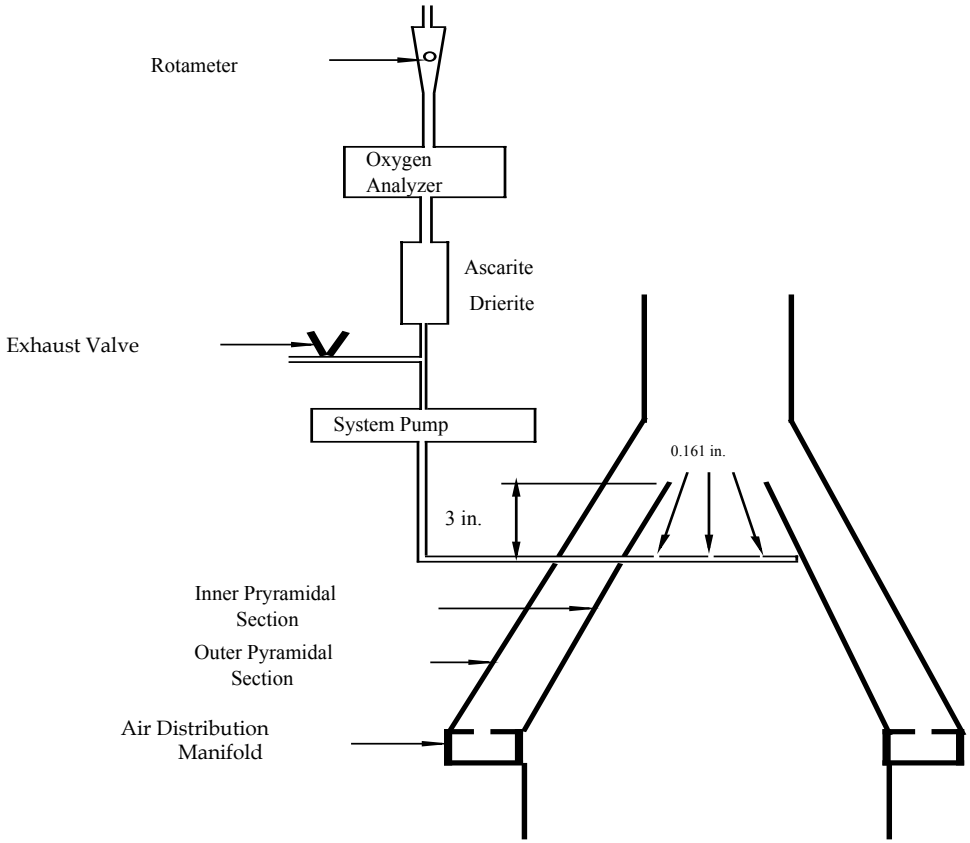
Wall Temperature Change vs. Radiant Panel Power



Methane Calibration with Wall Temperature Correction
1.54 Watts - 2.55Watts - 3.57 Watts

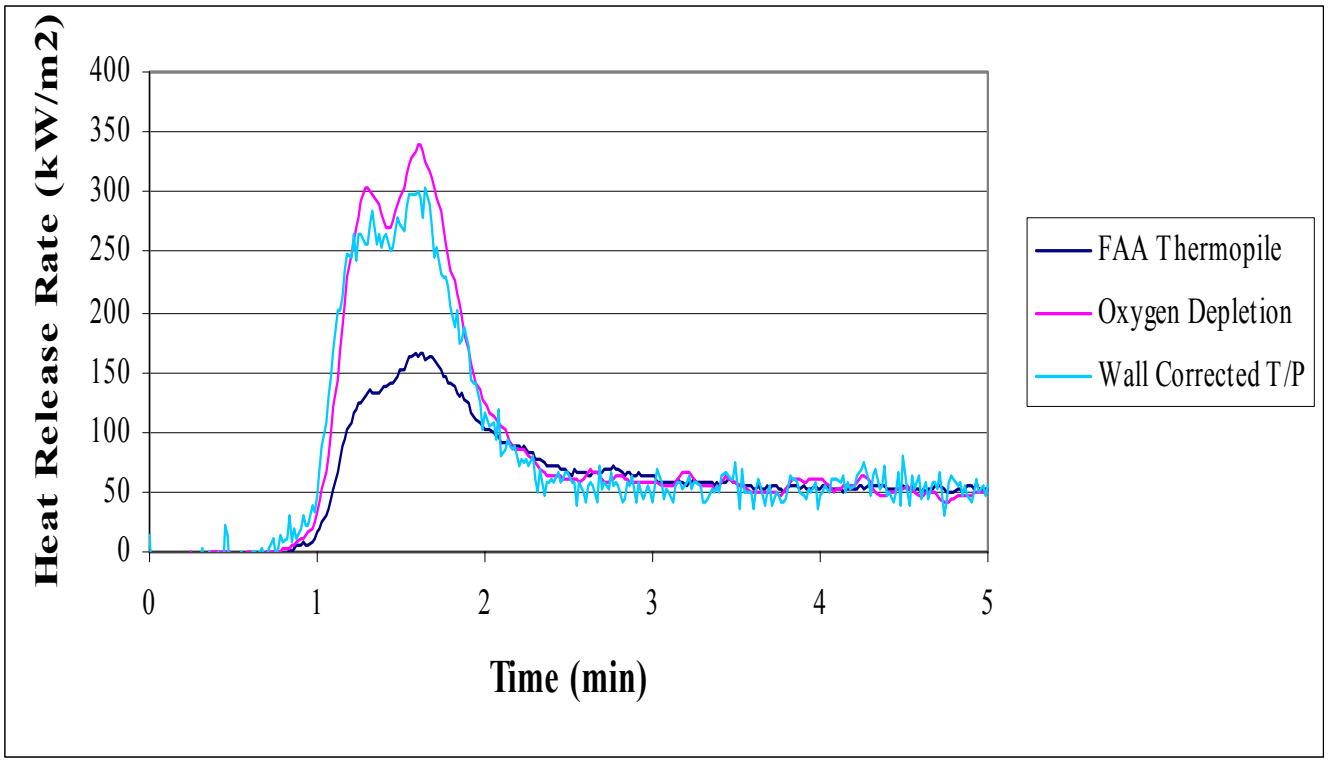


OSU Oxygen Depletion System



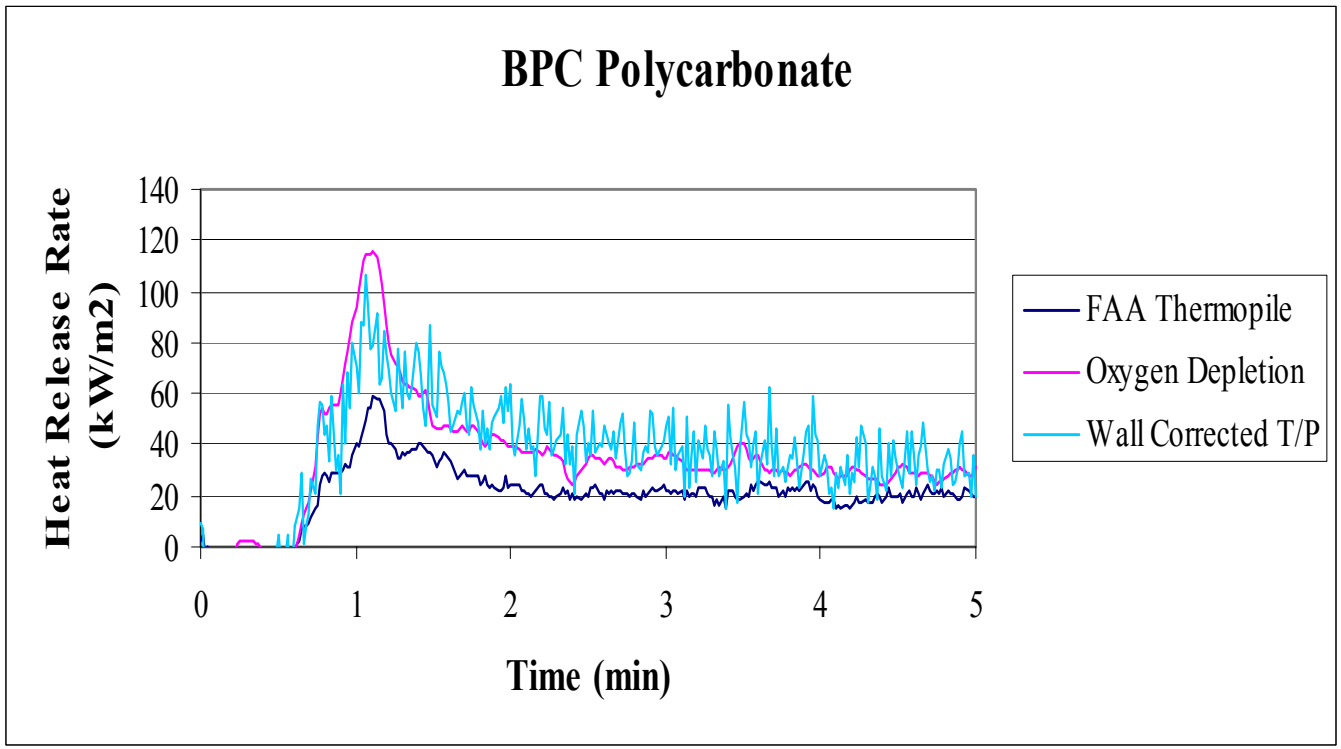
Rate of Heat Release Comparison

Bisphenol-A Polycarbonate



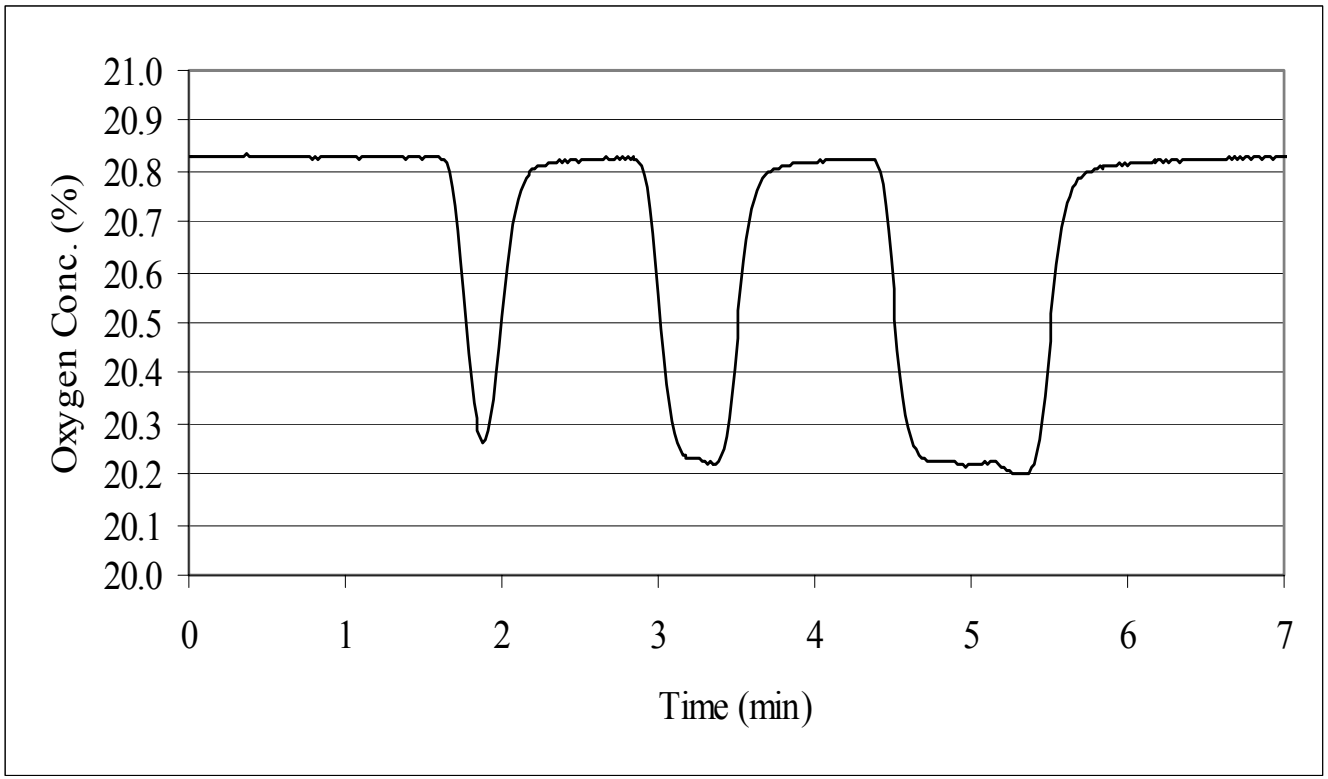
Rate of Heat Release Comparison

Bisphenol-C Polycarbonate



Atlas Cone Calorimeter ASTM-E1354

Cone Oxygen Analyzer Response to Methane Step Change

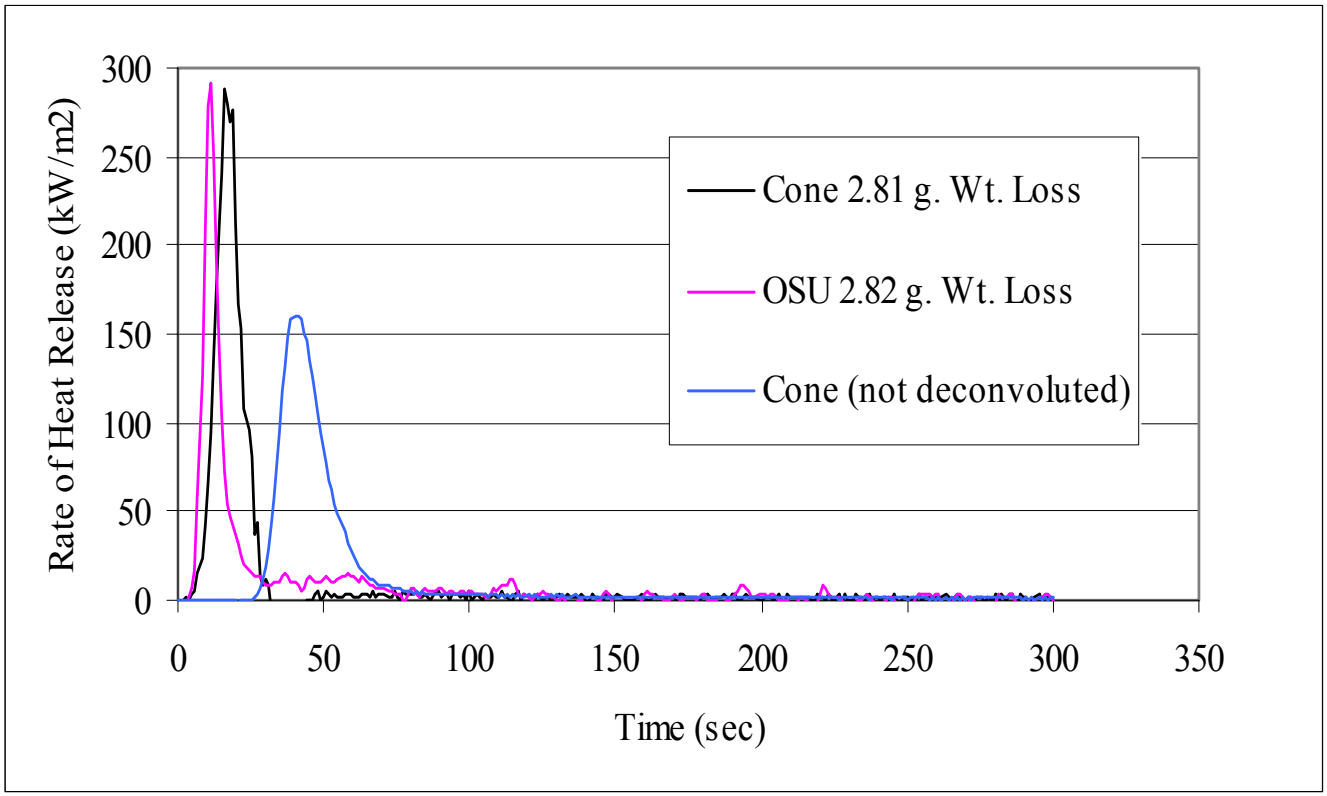


Time Deconvolution of Cone Data

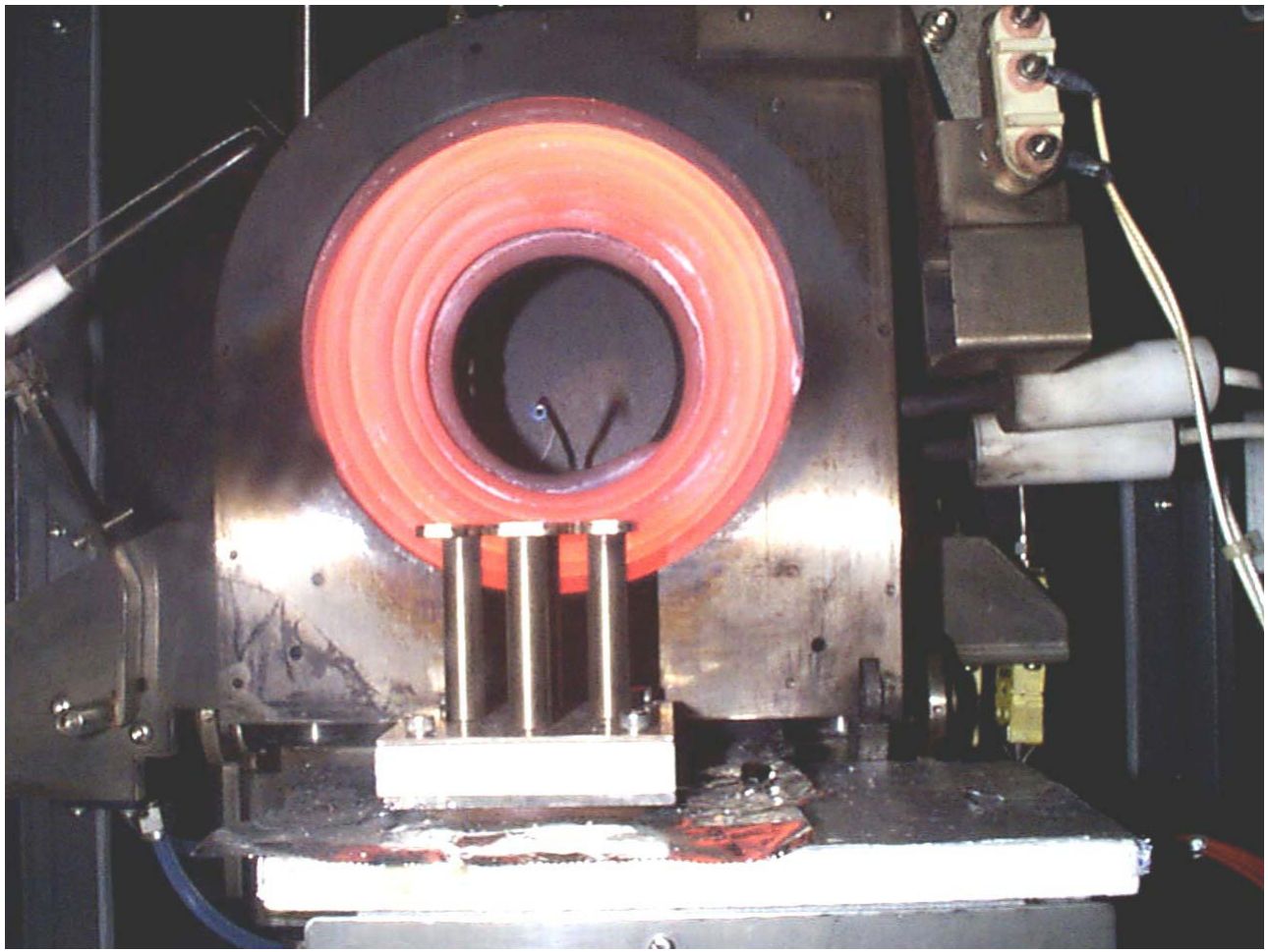
- **Experimentally Determine Time Constant**
  68% Full Scale Equilibrium Concentration Value
  $HRR_{deconvoluted} = HRR + 9*dHRR/dt$
- **Numerically Determine the Rate of Change**
  $dHRR/dt_{(t)} = (HRR_{(t+2)} + 8*HRR_{(t+1)} + 8*HRR_{(t-1)} + HRR_{(t-2)})/12$

Cone OSU Comparison

Rate of Heat Release Rate - BPA Epoxy Fiberglass Laminate

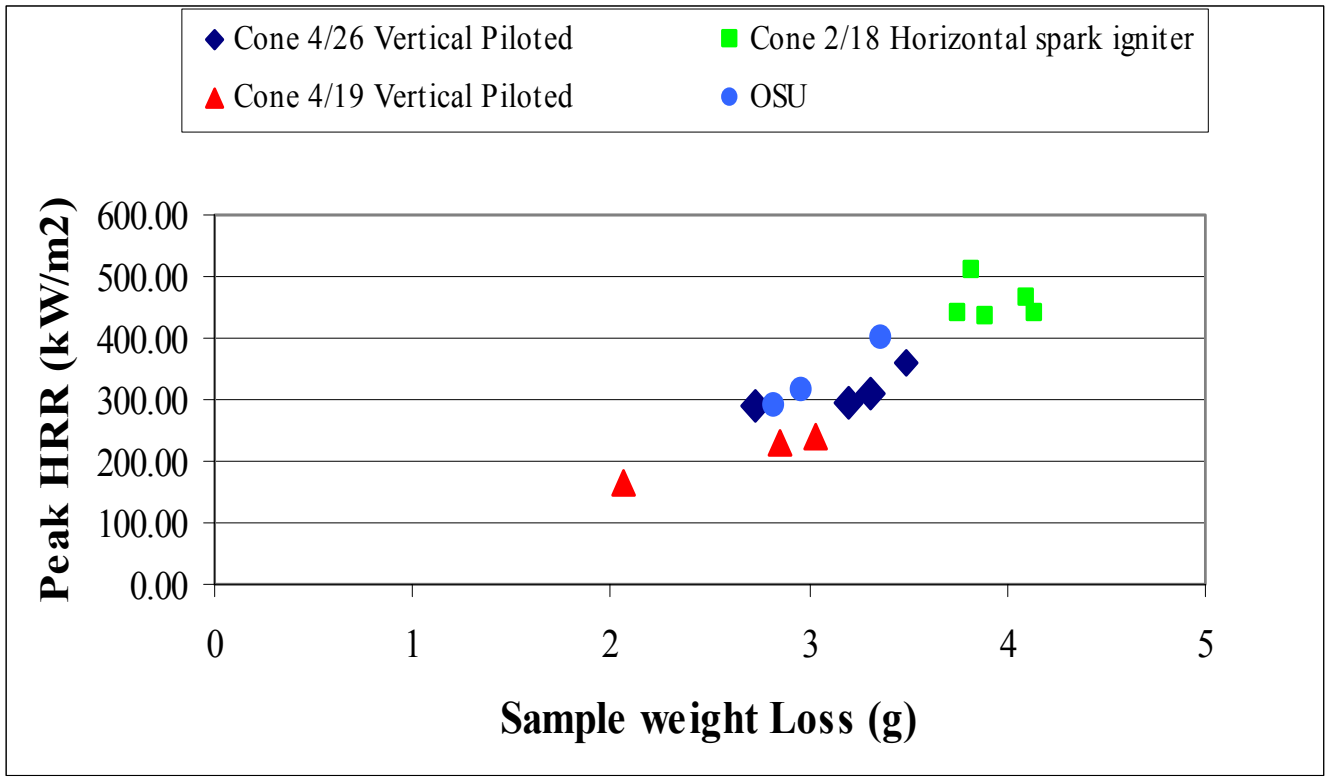


Cone Calorimeter - Vertical Orientation with Pilot Flame



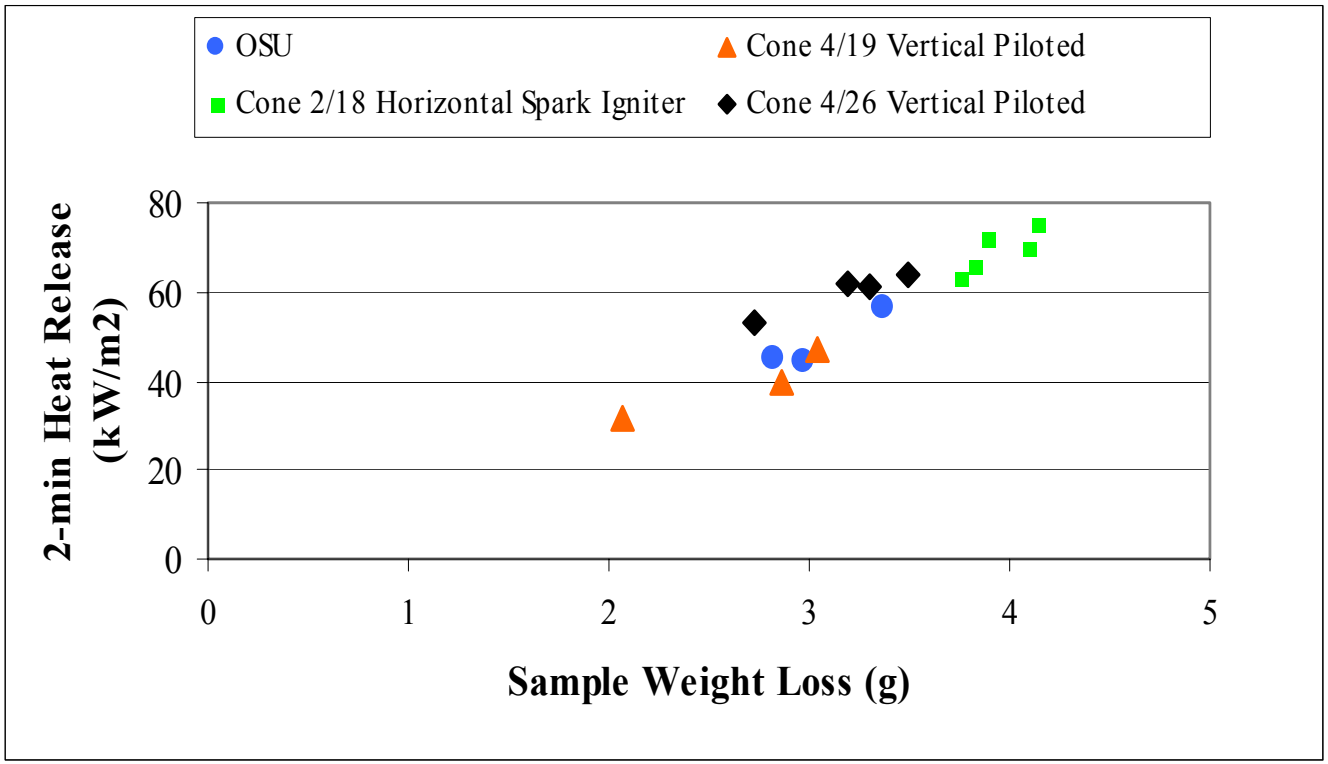
Cone OSU Comparison

Bisphenol-A Polycarbonate - Peak HRR/gram Wt. Loss



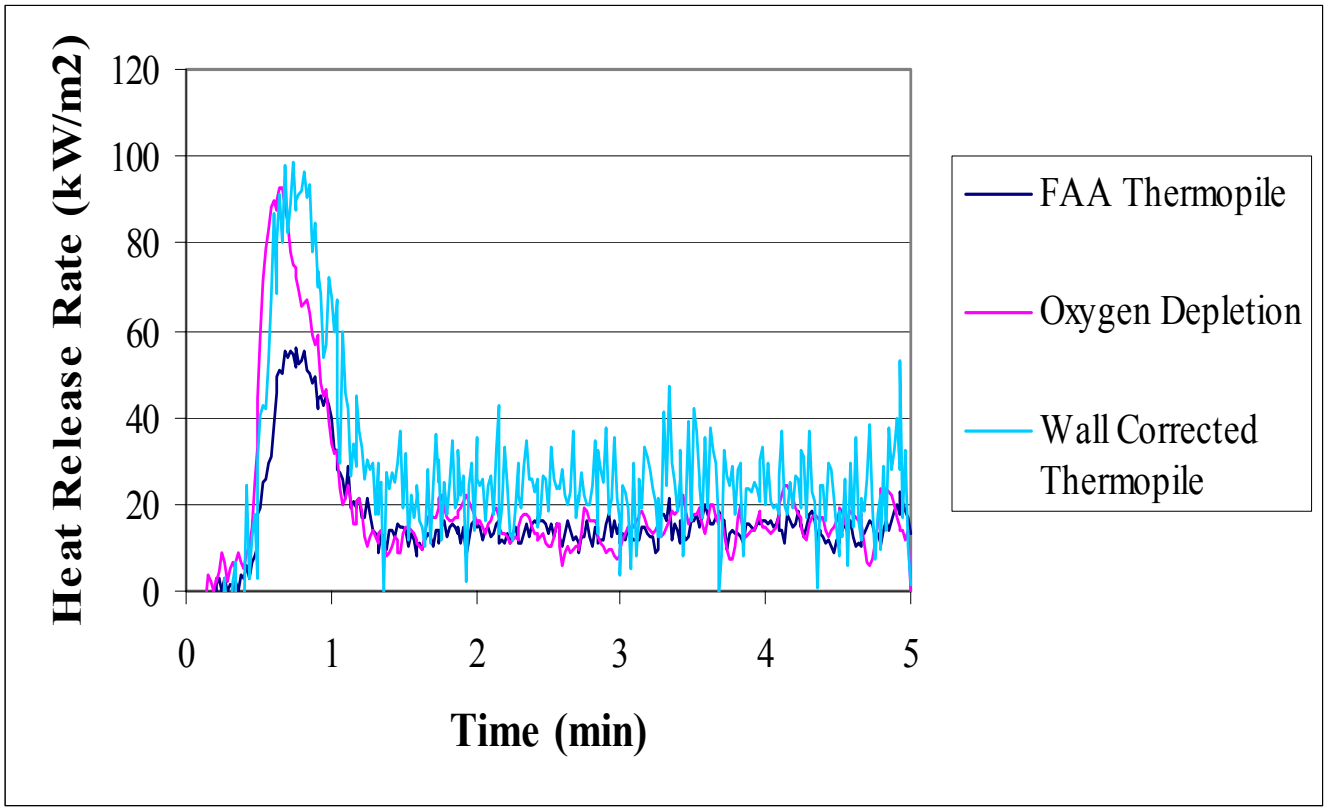
Cone OSU Comparison

Bisphenol-A Polycarbonate 2-min HR/gram Wt. Loss



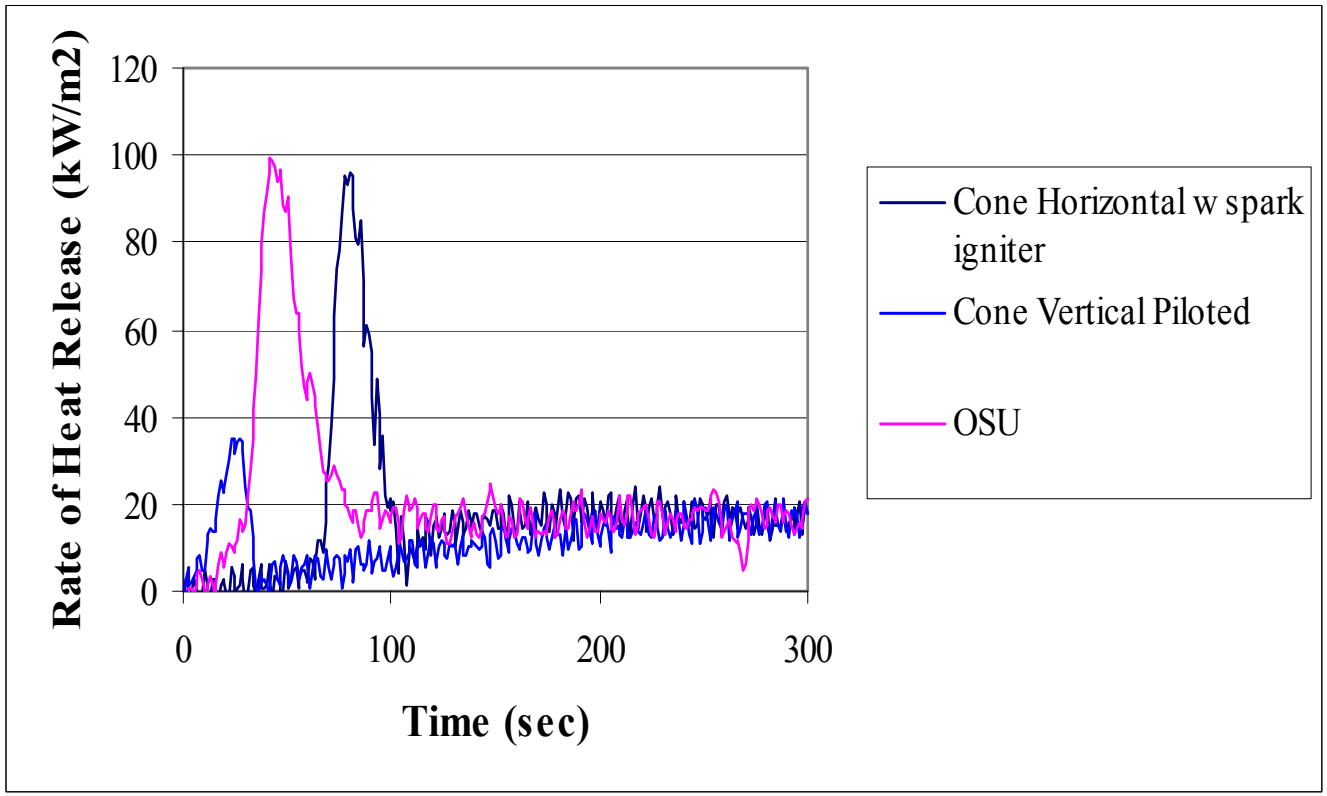
OSU Comparative Results

Schneller Crush-core Panel (Round Robin)



Cone OSU Comparison

Schneller Crush-core Panel



Conclusions

- 1. The OSU and Cone calorimeters have shown reproducible results when using the oxygen depletion technique for moderately flammable materials. When both instruments are properly calibrated and the Cone calorimeter is adjusted or time deconvoluted for the response time delay of the paramagnetic oxygen analyzer the techniques generated reproducible data within the expected accuracy of fire test measurements.
- 2. The thermopile and oxygen depletion technique are in good agreement for the Ohio State University Rate of Heat Release Apparatus (OSU) when correction of the thermopile signal is accomplished for radiant heat release absorbed into the body of the apparatus. Wall corrected thermopile data had considerably more signal noise and variability than either the oxygen depletion technique examined or the standard thermopile measurement technique used for regulatory purposes.
- 3. For low heat release materials capable of meeting FAR 25.853 test criteria, successful correlation of OSU and Cone calorimeter data has not been demonstrated. Further research is warranted on impinging pilot size, the use of an upper pilot arrangement and specimen pre-heating.