

**THIN-FILAMENT PYROMETRY AND ANALYSIS OF EXTINCTION ONSET TEMPERATURES FOR ETHYLENE FLAMES ON THE BURNING RATE EMULATOR IN THE INTERNATIONAL SPACE STATION – BY RYAN M. VENZON**

**Abstract**

The temperature at the extinction onset when flame instability begins was determined through Thin-Filament Pyrometry (TFP) for ethylene flames on the Burning Rate Emulator (BRE). TFP is a technique that converts the intensity of thermal radiation into temperature, and it involves insertion of SiC filaments into a flame. The filaments glow as they emit radiation, and the process is captured by a digital camera that is calibrated to interpret the pixels of the filaments in the image into gas temperature. The four BRE-produced flames analysed with intensity ratio TFP used a 25-mm burner in microgravity environment of the International Space Station. The results of the TFP analysis showed that the extinction onset temperature is 1,168 K, between the 1,100 K and 1,200 K projection and simulation from previous studies. This finding can define more precisely and accurately the flammability range of materials used within spacecrafts. In addition, the TFP-measured temperatures were found to differ by as much as 200-700 K from CEA-calculated temperatures derived from theoretical equilibrium equation and radiometer reading. This discrepancy suggests the necessity of revisiting the assumptions and input parameters used in inferring flame temperature from radiometry. With these findings, a better understanding of the fundamentals of combustion in microgravity is achieved towards the ultimate aim of improving fire safety in spacecrafts.