MICROGRAVITY SCIENCES AND PROCESSES (A2)
Science Results from Ground Based Research (4)

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IGNITION PROPERTIES OF COMBUSTIBLE SOLIDS IN A SIMULATED LOW-GRAVITY ENVIRONMENT

Abstract

A narrow channel apparatus originally developed for the production of a low-gravity flame spread environment is modified to examine the ignition phenomena of solid fuels in microgravity at low velocity flow. Both a thermally thin fuel (cellulose) and a thick fuel (polymethylmethacrylate) are used. The fuel sample is suspended in the center of the narrow channel, and a forced airflow is established parallel to the sample surfaces. Ignition tests are conducted by exposing the sample to an external radiant heat flux from a conical heater. For the thin fuel, autoignition is achieved; while pilot ignition is prompted with a spark igniter for the thick fuel. Thermocouples on the surface of the sample measure the surface temperature; video cameras record the ignition behavior. The ignition delay times are measured for various radiant heat fluxes and flow velocities. For a fixed flow velocity, the critical heat flux is determined by extrapolating ignition delay data at different heat fluxes. Where data are available, present experimental results are compared with those of other studies. The implications of these results are discussed.