

MICROGRAVITY SCIENCES AND PROCESSES SYMPOSIUM (A2)
Microgravity Sciences Onboard the International Space Station and Beyond (6)

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THE ATOMIZATION OBSERVATION EXPERIMENT IN JEM

Abstract

The liquid atomization is very important to spray combustion. However, atomization mechanism is poorly understood due to the technical difficulty that the phenomenon ends with an extremely short period and tiny scale that it only can be interpreted by high-speed camera technique. JAXA has newly developed Atomization Observation Equipment (hereafter referred as AOE) for space experiment in JEM / ISS. The purpose of this experiment is validation of the new atomization concept by observing the breakup behaviors of water jets in closeup. The new atomization concept is “Every jet has its own deterministic self-destabilizing mechanism”. Until now, we don’t have any question about previous atomization concept that an unstable wave component responsible for a jet disintegration always exists among “random disturbances” produced in the nozzle. But the new concept deny it. We will try to validate the new concept in JEM. AOE had began to be developed from 2012 and we finished the development at March 2015. The equipment will be launched to the ISS in 2015. AOE will be attached to the Work Volume section of the Multi-purpose Small Payload Rack in JEM. At this experiment, water is injected from syringe. Then the water is atomized after a period of time. We shoot the behavior with high-speed camera. And also injection speed is changed in three type (A type, B type and C type). On Type A, injection speed is continuously changed in order to investigate atomization hysteresis. Type B is intermittent injection type. We will compare the result of experiment Type A and Type B. The water is injected at a constant

rate on Type C. We expect to acquire correlation function of breakup distance in this type. AOE has mainly three functions. First function is speed control of injection water. The injection water speed can be precisely controlled by linear encoder. This is the most important in this experiment. The second is acquiring the image of water jet with high speed camera. The high speed camera equipped with an electric zooming / focusing lens is to capture the high speed image of water injection. The last function is measurement of various data such as water speed and temperature. We will introduce the overview of AOE and report the results of atomization observation experiment in the presentation.