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# THE HARDWARE DEVELOPMENT FOR THE LOW-SPEED LOW-LEWIS-NUMBER COUNTER FLOW FLAME EXPERIMENT ON ISS KIBO

**Abstract**

We introduce new hardware which will use for a microgravity experiment in International Space Station(ISS) Japanese module KIBO. The experiment is called Low-speed Low-Lewis-number counter flow Flame experiment (L3-Flame). The purpose of this experiment is to observe the combustion in microgravity and get precise data of the extinction limit in low-speed, low-lewis-number gases. Also, we aim at acquiring the fundamental data to show the correlation between planar flame and flame ball. Planar flame is flame type created by counter flow. Flame ball is known as flowless constant flame type which is appeared only in microgravity. Conventionally, planar flame and flame ball have been treated separately. However, we aim at describing the comprehensive combustion limit theory which can treat planar flame and flame ball in a unified manner. To verify this purpose, we need microgravity environment where do not need to consider the heat loss from convection caused by gravity. In microgravity, we create the planar flame by counter flow at first. Then, gradually change the condition of combustion such as concentration of the fuel or velocity of the gas flow towards extinction limit. In this process, we observe the extinction of planar flame. Or, in specific conditions, we observe the transition from planar flame to flame ball. We select the condition of combustion and repeat this procedure. We are now developing the hardware system for this experiment. It has two gas burners facing each other to create the counter flow. Burners are contained in combustion chamber. Three observation cameras are installed to shoot the behavior of the flame from XYZ directions. We launched fuel and inert gas bottles together with the hardware. Fuel and inert gases are supplied from bottles, then mixed and flowed into the combustion chamber. Mass flow controllers are set between the bottles and mixing point to control the concentration and velocity of each gas. The conceptual design of this hardware system is almost fixed. We will start developing the hardware from this April and will complete in the end of 2019. Then, we will launch the hardware and start space experiment in ISS Japanese module KIBO in 2020.