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JAXA および NASA 公募テーマの「きぼう」搭載用静電浮遊炉実験状況

Status of JAXA and NASA Experiments Using the Electrostatic Levitation Furnace onboard the ISS-KIBO.

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Assessing the thermophysical properties of melts at temperatures exceeding 2000°C and suppressing hetero-nucleation are highly challenging due to reactions between the molten samples and containers. To address these problem, containerless techniques such as electromagnetic, aerodynamic, or electrostatic levitation have been developed. In electrostatic levitation, the Coulomb force between a charged sample and surrounding electrodes is employed to manipulate the sample's position. Our group developed the Electrostatic Levitation Furnace (ELF)[1-4], based on the several key technologies essential for stable sample positioning and scientific observations. In 2016, ELF was installed onboard the International Space Station (ISS). ELF allows for precise control of the sample's position, melting and solidification, as well as the measurement of thermophysical properties such as density, surface tension, and viscosity under microgravity conditions. Seventeen missions except private commercial experiments have been conducting so far (table 1). 13 missions were selected by JAXA, and 4 missions were selected by NASA. 9 missions have successfully completed space experiments, 3 missions are currently conducting experiments in space, and 5 missions are in preparation on the ground. Implementation plans for each domestic experiment will be explained and the results of NASA experiments[5-6)] will be introduced in the presentation.

Table 1 Status of ELF experiments selected by JAXA (#1-13) and NASA (#14-17)

#	Mission name	Principal Investigator (Affiliation)	Experiment status
1	ELF Tech Demo	T. Ishikawa (JAXA)	Ongoing
2	Interfacial Energy	M. Watanabe (Gakushuin Univ.)	Ongoing
3	Fragility	S. Kohara (NIMS)	Completed
4	Hetero-3D	S. Suzuki (Waseda Univ.)	Completed
5	B4C-SS eutectic	H. Yamano (JAEA)	Completed
6	Laser Debris Removal	K. Mori (Osaka Metropolitan Univ.)	Completed
7	Thermal Storage	K. Kobatake (Doshisha Univ.)	Completed
8	Multi Shell Sphere	T. Masaki (Shibaura Institute Tech.)	Completed
9	Silicate Melt	Y. Kono (Kwansei Gakuin Univ.)	Completed

10	Unconventional Glass	A. Masuno (Kyoto Univ.)	In preparation
11	Space Egg	T. Nakamura (Tohoku Univ.)	In preparation
12	Phase Transition	A. Okawa (Tohoku Univ.)	In preparation
13	TBD	S. Ozawa (Chiba Institute Tech.)	In preparation
14	Round Robin	D. Matson (Tuft Univ.)	Completed
15	Superglass	R. Weber (Materials Development Inc.)	Completed
16	Resonance Induced Instability	R. Narayanan (Univ. Florida)	Ongoing
17	TBD	R. Hyers (Worcester Polytechnic Int.)	In preparation

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