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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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The electrostatic levitation furnace (ELF) can measure the thermophysical properties (density, viscosity, surface tension, etc.) of high-temperature melts over 2000°C [1)]. Through the development and research of ELF on the ground, the ELF was installed on the ISS in 2016. After the initial operation check, ELF transitioned to regular operation. Until now, JAXA and NASA have publicly solicited ELF experiment themes for Kibo, and 23 missions (Table 1), excluding private commercial experiments, have been selected (Table 1). Of these, 20 missions have been adopted by JAXA and 3 missions by NASA (Table 1). 12 missions have completed space experiments, and 11 missions are in the space experiment phase or are in preparation on the ground. Through operations including technological development to date, results have been obtained for many experimental themes, and technical challenges have been identified. In addition, new applications other than thermophysical property measurements have been developed by taking advantage of the characteristics of the levitation and position control of materials and laser heating. This paper introduces the plans, status, and results of each experiment, including those in JAXA's and NASA's experiments.

Table 1 Status of ELF experiments selected by JAXA (#1-20) and NASA (#21-23)

#	Mission name	Principal Investigator (Affiliation)	Experiment status	Ref.
1	ELF Tech Demo	T. Ishikawa (JAXA)	Ongoing	2-4
2	Interfacial Energy	M. Watanabe (Gakushuin Univ.)	Completed	5
3	Fragility	S. Kohara (NIMS)	Completed	6-8
4	Hetero-3D	S. Suzuki (Waseda Univ.)	Completed	9-11
5	B4C-SS eutectic	H. Yamano (JAEA)	Completed	12
6	Laser Debris Removal	K. Mori (Osaka Metropolitan Univ.)	Completed	13
7	Thermal Storage	K. Kobatake (Doshisha Univ.)	Completed	14
8	Multi Shell Sphere	T. Masaki (Shibaura Institute Tech.)	Completed	15
9	Silicate Melt	Y. Kono (Kwansei Gakuin Univ.)	Completed	16
10	Unconventional Glass	A. Masuno (Kyoto Univ.)	Completed	17

11	Space Egg	T. Nakamura (Tohoku Univ.)	Ongoing	18
12	Phase Transition	A. Okawa (Tohoku Univ.)	Ongoing	19
13	Oxygen Analysis	S. Ozawa (Chiba Institute Tech.)	Ongoing	20
14	Silicate melt 2	Y. Kono (Kwansei Gakuin Univ.)	In preparation	-
15	Unconventional glass 2 (UG2)	A. Masuno (Kyoto Univ.)	In preparation	-
16	Unconventional glass 3 (UG3)	A. Masuno (Kyoto Univ.)	In preparation	-
17	TBD	H. Takeda (UNITIKA LTD.)	In preparation	-
18	ISRU-Regolith CaF2	Y. Suzuki (Doshisha Univ.)	In preparation	-
19	TBD	S. Shiratori (Tokyo City Univ.)	In preparation	-
20	Alloying Beyond Gravity	K. Horikawa (Osaka Univ.)	In preparation	-
21	Round Robin	D. Matson (Tuft Univ.)	Completed	21, 22
22	Superglass	R. Weber (Materials Development Inc.)	Completed	23, 24
23	Resonance Induced Instability	R. Narayanan (Univ. Florida)	Completed	25, 26

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