

Gas-Liquid Two Phase Flow Behavior Related to ECLSS

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● Abstract

Elucidate the effects of gravity on gas-liquid two-phase flows to develop separation techniques for gas-liquid two-phase flows generated by the operation of the Environment Control and Life Support System (ECLSS).

● Reasons and benefits of using JAXA Supercomputer System

In order to evaluate the performance of gas-liquid separation technology, it is necessary to evaluate the microscopic physical phenomena of gas-liquid two-phase flows under microgravity. Large-scale and high-speed numerical simulations are essential for this study on Earth, and the vast computational resources provided by JSS are important.

● Achievements of the Year

To develop a gas-liquid separator mechanism for the Sabatier reaction in an air regeneration system, a gas-liquid separator using capillary forces was modeled and its performance was evaluated by numerical simulation (Fig. 1). The operation of the gas-liquid separator was reproduced by combining hydrophilic and hydrophobic particulate porous media and injecting gas-liquid two-phase flow from the top (Fig. 2).

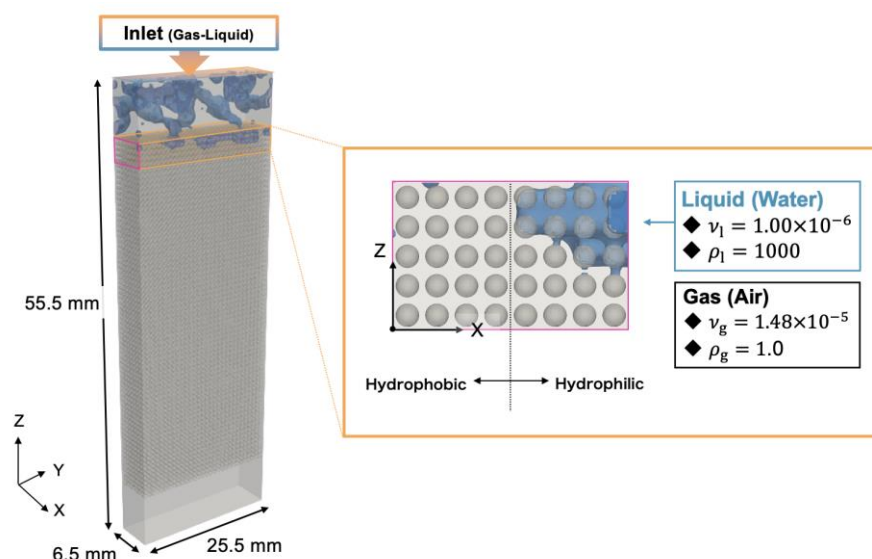


Fig. 1: Simulation model reproducing a capillary force driven gas-liquid separator.

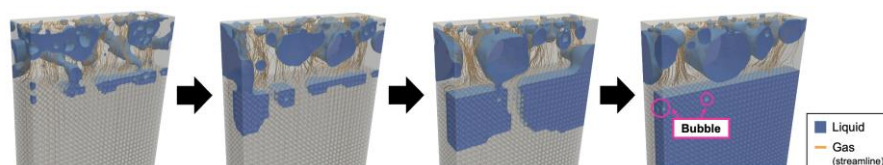


Fig. 2: Simulation visualization results (Gas: 900 ml/min, Liquid: 100 ml/min)

● Publications

- Poster Presentations

"Numerical simulation of gas-liquid separation device under gas-rich conditions considering carbon dioxide reduction system" 67th Space Science and Technology Conference

● Usage of JSS

● Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	144 - 324
Elapsed Time per Case	24 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.42

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	0.00	0.00
TOKI-ST	3,335,120.88	3.60
TOKI-GP	0.00	0.00
TOKI-XM	586.95	0.32
TOKI-LM	0.00	0.00
TOKI-TST	0.00	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2 (%)
/home	245.00	0.20
/data and /data2	133,020.00	0.82
/ssd	2,510.00	0.24

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	2.73	0.01

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage : Percentage of usage relative to each resource used in one year.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage ^{*2} (%)
ISV Software Licenses (Total)	47.31	0.02

^{*2}: Fraction of Usage : Percentage of usage relative to each resource used in one year.