



Press Release

11/21/2022

Microwave Chemical Co., Ltd.

**The World's First Multi-Stage Microwave Freeze Dryer "SiriusWave" Delivering Significant Time Reduction and Higher Quality in Foods and Drugs**

Microwave Chemical Co., Ltd. (Suita, Osaka; CEO: YOSHINO Iwao) hereby announces the launch of the "SiriusWave" microwave-based multi-stage freeze dryer for foods, pharmaceuticals and the other applications.

Freeze drying is a means of vaporizing water and the like supplying heat to frozen solids, and is widely used to obtain solid materials, such as instant foods or to powder heat-sensitive drugs, such as antibodies and oligonucleotides. However, due to the indirect and inefficient manner of heat transfer, the conventional method often presented a challenge that the process was taking a great amount of time.

Scientists reported that freeze-drying time could be shortened using microwaves that directly heat materials, however, microwave freeze dryer has not been realized so far. Then we have developed a microwave freeze-drying demonstration facility that applies the microwave process and equipment design as well as control technologies we have acquired through industrialization in the chemical, pharmaceutical and the other fields. Using this equipment, we have successfully demonstrated that microwave energy can be uniformly transferred to multiple samples placed on shelves for drying in a short time and confirmed that this system enables significant reduction in freeze-drying time and improvement of quality.

As described in our press release dated November 7, 2022, we are also in the process of introducing our "SiriusWave" microwave multi-stage freeze dryer to Asahi Group Foods Ltd., a leading manufacturer of freeze-dried food products.

We plan to promote microwave freeze-drying in the food, pharmaceutical, and other industries, through the sales of the equipment, and to further provide GMP<sup>\*1</sup> compliant

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equipment for pharmaceutical applications. We are trying to innovate freeze drying technologies by providing solutions to widely known issues such as reducing time for drying.

\*1 GMP: Good Manufacturing Practice

#### 【About Microwaves】

Microwave is an electromagnetic wave which is frequently used for household microwave oven and communication applications. Microwaves can transfer energy to materials directly and selectively. As microwaves can be generated from electricity, through its use of renewable energy, this technology contributes to decarbonization.

#### 【Image and Specification】



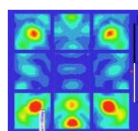
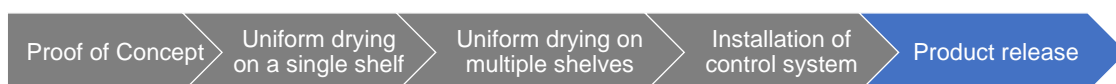
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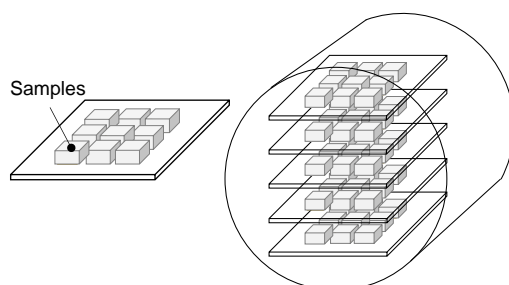
<b>Basic specifications</b>	Microwave generator	2450 MHz, 1 kW
	Microwave control system	Phase control etc.
	Number of shelves	4
	Usable Shelf area	0.65 m <sup>2</sup>
	Shelf temperature	-40 ~ 120 °C
<b>Condenser</b>	Condenser capacity	30 kg/batch
	Condenser temperature	Below -50 °C
<b>Vacuum system</b>	Ultimate vacuum	Below 4 Pa

\*Customizable to customer's requirements.

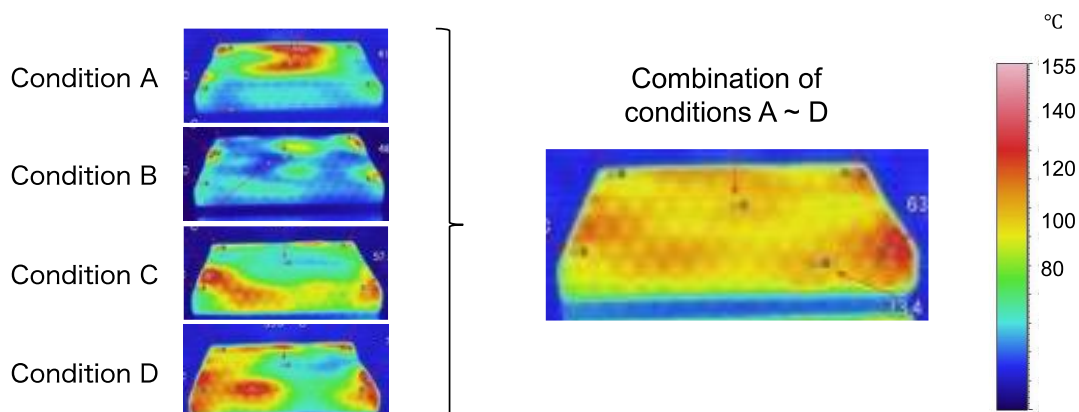
【Technology details (1): Flow of product development】



Example of electromagnetic field distribution simulation



【Technology details (2): Uniform heating of samples using phase control technology】



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