





(EUROPE)

Kerone Research & Development Centre (KRDC)

B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India Tel- +91-251-2620542/13/44/45/46, Email-info@kerone.com, www.kerone.com



Batch Microwave Heat Treatment for Sterilization of Protein Powder

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Customer :	M/s. Advanced Enzyme Technologies Ltd.
Process :	Batch Microwave Heat Treatment for Sterilization of Protein Powder

Test Report No: 175/KRDC/LAB/17 Mum 04/01/2023

Date Sample reception	: 12/12/2022
ID	: 175/LAB/04
Sample Description:	

: As Requested
: Acceptable
: 03/01/2023
: Protein Powder
: 03/01/2023
: 03/01/2023

Laboratory Experimental System -



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System Specifications -

Microwave Power	2 KW (CW)
Frequency	$2450 \text{ MHz} \pm 50$
Convective Power	3.5 KW (airflow 350 I/min at 20°C)
Microwave Exposure Zone (Cavity)	1 Cubic meter
Mode Stirrer	One
Thermal Monitoring	Single Channel Fiber Optic: Range -
System	40 to 250°C
Exhaust Power	1 HP
Tray size	450*950*50 mm
(width*height*depth)	

Laboratory's Environmental Conditions -

Temperature (degree C)	29.4°C (±5°C)
Humidity (%)	≤50% RH
Pressure (kN/m2 or kPa)	Not recorded

Note for recommendation: Environmental conditions have a direct impact on test results. Accuracy and consistency of test data are affected by the laboratory conditions

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Equipment Used -

Name of Equipment	Picture of Equipment	Specifications
Compact Thermal Imaging Camera		Model: FLIR E-30 Resolution: 160x 120IR Thermal sensitivity of 0.10°C
Thermo Hygrometer	- Charter	Model No: HTC-2 Temperature accuracy: ±°C (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: ±5% RH Humidity resolution: 1% RH

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Procedure of the Experiment -

- The experiment was performed on Protein Powder to speed up the heating rate.
- For this experimental run, the given sample was placed in the MW heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

Trials	Sample	Cycle Time	Specifications of Microwave	
	Wt.			Remark
	(gms.)			
1	200	7	Magnetron Power: 1 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (59-62) °C
2	200	10	Magnetron Power: 1 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (94-95) °C
3	200	15	Magnetron Power: 1 kW;	Charring & lumps formation observed
			Set temp: 85°C	No weight loss
				Bag deformation
				On product temp: (115-117) °C
4	200	7	Magnetron Power: 1.5 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (103-105) °C
5	200	5	Magnetron Power: 1.5 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (61-67) °C
6	200	7	Magnetron Power: 1.8 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (95-98) °C
7	200	5	Magnetron Power: 1.8 kW;	No Charring
			Set temp: 85°C	No weight loss
				On product temp: (93-95) °C

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Images during trials:

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1	Tend 2	The second second
Trial ; Gene Processor	Barra Madamert Marine Secon	Sature Sature
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	12.	- and -
		Constant.

Treated Sample (Trial 1, Trial 2, Trial 3)



Treated Sample (Trial 4, Trial 5)

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Treated Sample (Trial 6, Trial 7)

Sp1	59.5°C	And a second
Sp2	62.2°C	
Sp3	61.9°C	19 10 10 10 10 10 10 10 10 10 10 10 10 10
Parameters		
Emissivity	1.00	
	10 50 5	

Thermal Images:

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Sp1	95.6°C
Sp2	95.6°C
Sp3	94.4°C
Parameters	
Emissivity	1.00
Tomp	100.3°C



Sp1	113.6°C
Sp2	116.1°C
Sp3	117.0°C
Parameters	
Emissivity	1.00
Temn	123.6°C



Measurements	5	
Sp1	103.5°C	
Sp2	104.1°C	
Sp3	105.4°C	
-		
Parameters		1 400 4 40
Parameters Emissivity	1.00	- \$ 105.4 °C

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Sp1	61.5°C
Sp2	67.4°C
Sp3	61.9°C
Parameters	
Emissivity	1.00
Temp	70.3°C



Sp1	98.8°C
Sp2	95.2°C
Sp3	98.5°C
Parameters	
Emissivity	1.00
Temp.	103.0°C



Measurements			
Sp1	95.6°C	Re-	10.
Sp2	93.6°C	1 de la companya de l	
Sp3	94.4°C	495.6 °C	1.00
Parameters		Children and the state	
Emissivity	1.00	1994 C	
Temn	102.4°C		

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Observations:

The heating behavior of Protein Powder was investigated under the Microwave heating system. The heating rate was found to be increasing with respect to increasing in time. As per the physical investigation, it was observed that the sterilization of the product was achieved without any charring effect up to temperature (90-95) °C. Temperature above 100°C the product color changed and lump formation was observed.

Ms. Sayali Asole (Tested By)

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