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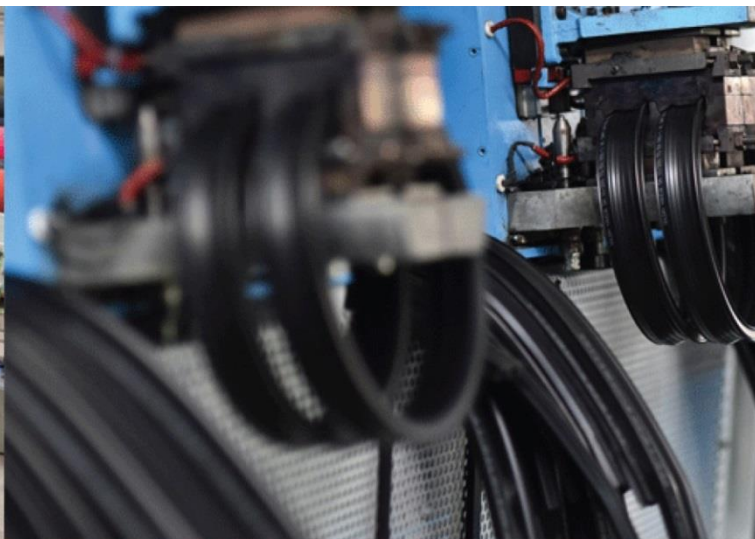
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In Association With



ELECTRO MAGNETIC innovative technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambarnath (East), Thane- 421 506, India
Tel- +91-251-2620542/43/44/45/46, Email-info@kerone.com, www.kerone.com



**Batch Microwave+Convection Heat
Treatment for Drying of Medicinal Powders**

ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001

In Association with SVCH-Technologii, Moscow (Russia)



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Customer :	Laboratory Experimental Analysis
Process :	Batch Microwave+Convection Heat Treatment for Drying of Medicinal Powders

TEST REPORT No: 47/KRDC/LAB/17 Mum 24/12/2018

Date Sample reception : 24/12/2018
ID : 47/LAB/75

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : Paracetamol-75 kg & Metformin-80 kg
Sampling date : 07/01/2019
Product : Paracetamol Powder & Metformin Powder
Requirement : Final product must have moisture content less than or equal to 0.5%
Start Date test : 07/01/2019
End Date test : 08/01/2019

LABORATORY EXPERIMENTAL SET UP:



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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 kW(CW)
Frequency	2450 MHz \pm 50
Convective Power	3.5 kW (air flow 350 l/min at 20°C)
Microwave Exposure Zone (cavity)	1 cubic meter
Mode Stirrer	One
Thermal Monitoring System	Single Channel Fiber Optic: Range -40 to 250°C
Exhaust Power	1HP
Tray Size	450x950x50 mm





ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	28.1°C (\pm 5°C)
Humidity (%)	\leq 63% RH
Pressure (kN/m ² 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



EQUIPMENTS USED:

Name of Equipment	Picture of Equipment	Specifications
Infrared Thermometer		Model: FLUKE 566 Temperature Range: -40°C to 650°C Display Resolution: 0.1°
Digital Contact Thermometer		Model No: TM-902C Temperature range: -50~750°C Temperature accuracy: $\pm 1^{\circ}\text{C}$
Moisture Analyzer		Make: Axis Balance Description: Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)
Thermo Hygrometer		Model No: HTC-2 Temperature accuracy: $\pm^{\circ}\text{C}$ (1.8°F) Temperature resolution: 0.1°C (0.2°F) Humidity range: 10%~99% RH Humidity accuracy: $\pm 5\%$ RH Humidity resolution: 1% RH

SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Paracetamol powder and Metformin powder separately without adding any additive to speed up the drying rate. For this experimental run, particular quantity of

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sample has been taken in microwave transparent tray with uniform thickness and this powder loaded tray has been placed in heating system with different setting parameters. The observations are made on the basis of LOD and moisture content.

ANALYTICAL RESULTS:

1. Paracetamol:

Initial Moisture Content: 5.6%

	Trail No. 1		Trial No.2	Trial No.3	Trial No. 4	
	Initial 15 minutes	Next 15 minutes			Initial 15 minutes	Next 15 minutes
Microwave Power (kW)	1	1.5	2	2	2	2
Setting Temperature (°C)	80	80	110	140	140	140
Cake Thickness (mm)	10	10	20	15	15	15
Cycle Time (minutes)	15	(15+)15	15	20	15	(15+)15
Initial Weight (grams)	350	340	398	602	532	498
Final Weight (grams)	340	338	380	562	498	489
Temp. on Product after treatment (°C)	42-45	50-55	55-58	60-65	60-65	70-80
Final Moisture content (%)	3.6	0.47	1.1	0.5	2.1	0.2

2. Metformin:

Initial Weight: 570 grams

Initial Moisture Content: 0.8%

Microwave Power: 2 kW

Setting Temperature: 140°C

Cycle Time: 5 minutes

Final Weight: 549 grams

Final Moisture Content: 0%

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MOISTURE ANALYSIS REPORTS:

1. Pracetamol:

Drying started		Drying started		Drying started		Drying started	
Date : 7-01-2019		Date : 7-01-2019		Date : 7-01-2019		Date : 7-01-2019	
Time : 15:47:29		Time : 17:49:43		Time : 16:53:34		Time : 18:29:13	
Model: AGS200		Model: AGS200		Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138		Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters		Drying parameters		Drying parameters	
Product : Test		Product : Test		Product : Test		Product : Test	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C		Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard		Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode		Mode : Short mode		Mode : Short mode	
Calculation : $((w_0 - w) / w_0) \times 100\%$		Calculation : $((w_0 - w) / w_0) \times 100\%$		Calculation : $((w_0 - w) / w_0) \times 100\%$		Calculation : $((w_0 - w) / w_0) \times 100\%$	
Finished : 3 samples		Finished : 3 samples		Finished : 3 samples		Finished : 3 samples	
Initial weight : 0.997 g		Initial weight : 0.805 g		Initial weight : 0.543 g		Initial weight : 0.506 g	
Final weight : 0.694 g		Final weight : 0.801 g		Final weight : 0.537 g		Final weight : 0.505 g	
Drying time : 00:02:00s		Drying time : 00:01:40s		Drying time : 00:01:40s		Drying time : 00:01:40s	
Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 5.4 %		Moisture : 0.5 %		Moisture : 1.1 %		Moisture : 0.2 %	
NOTE Initial		NOTE Final (Trial No.3)		NOTE Final (Trial No.2)		NOTE Final (Trial No.4)	
The analysis performed by:		The analysis performed by:		The analysis performed by:		The analysis performed by:	
Signature: <u>K Komal</u>		Signature: <u>K Komal</u>		Signature: <u>K Komal</u>		Signature: <u>K Komal</u>	

2. Metformin:

Drying started		Drying started	
Date : 7-01-2019		Date : 7-01-2019	
Time : 18:48:29		Time : 18:45:06	
Model: AGS200		Model: AGS200	
Serial number : 138		Serial number : 138	
Drying parameters		Drying parameters	
Product : Test		Product : Test	
Drying temperature : 105.0 °C		Drying temperature : 105.0 °C	
Drying profile : standard		Drying profile : standard	
Mode : Short mode		Mode : Short mode	
Calculation : $((w_0 - w) / w_0) \times 100\%$		Calculation : $((w_0 - w) / w_0) \times 100\%$	
Finished : 3 samples		Finished : 3 samples	
Initial weight : 0.504 g		Initial weight : 0.589 g	
Final weight : 0.500 g		Final weight : 0.602 g	
Drying time : 00:01:40s		Drying time : 00:01:40s	
Sampling interval : 20 sec		Sampling interval : 20 sec	
Moisture : 0.8 %		Moisture : 0.8 %	
NOTE Initial		NOTE Final	
The analysis performed by:		The analysis performed by:	
Signature: <u>K Komal</u>		Signature: <u>K Komal</u>	

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The value obtained is already corrected for possible recover value stated, if applicable. This document may not be reproduced or disclosed wholly or partly in any part thereof without the written consent of the laboratory management or customer. This document relates only to the specimen samples processed. The processed sample will be kept in this laboratory for 7 days from the date of heat treatment.



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OBSRVATIONS:

The Drying behavior of Paracetamol powder and Metformin powder has been investigated under the microwave+convection heating system. The drying rate is found to be increasing with respect to increasing drying time. It has been found that the moisture content on the dry basis (%) decreases with respect to increase drying time. As per physical investigation, it has been observed that there is complete drying with required moisture content without colour change.

Miss Komal Bhoite
Tested By