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Batch Microwave+Convection Heat Treatment for Drying of Silicon Carbide

> ISO 9001-2008 | ISO 9001-2015 | EMS 14001 | OHSAS 18001 In Association with SVCH-Technologii, Moscow (Russia)

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Customer :	M/s. Grindwell Norton Ltd, Gujrat
Process :	Batch Microwave+Convection Heat Treatment for Drying of
	Silicon Carbide

## TEST REPORT No: 47/KRDC/LAB/17 Mum 10/06/2020

Date Sample reception	: 06/06/2020
ID	: 47/LAB/162

## SAMPLE DESCRIPTION:

Sampling	: As Requested
Sample Condition	: Acceptable
Quantity	: 26 Nos.
Sampling date	: 10/06/2020
Product	: Silicon Carbide
Requirement	: Drying
Start Date test	: 10/06/2020
End Date test	: 10/06/2020

## LABORATORY EXPERIMENTAL SET UP:





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## LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

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

## **ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:**

Temperature (degree C)	30°C (±5°C)		
Humidity (%)	≤75% 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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## **EQUIPMENTS 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		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		

## SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Silicon Carbide block to speed up the drying rate. For this experimental run, given sample placed in microwave heating system with suitable parameters. Observations are made after particular interval of time on LOD basis.

## **ANALYTICAL RESULTS:**

1. Trial No. 1:

Microwave Power: 1.5 kW Hot Air Temperature: 70°C Initial Moisture Content: 2.8% Product Quantity: 2 nos. (A1 & A2)

Sr.	Cycle Time	Sample	Initial Wt.	Final	Total Wt.	Surface	Remarks
No.	(minutes)	No.	(gm)	Wt. (gm)	Loss (gm)	Temp. (°C)	
1.	After 10	A1 A2	1142 1136	1140 1135	2 1	75-80	Drying rate started

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2.	After 30	A1	1140	1121	19	115-120	Drying phase
		A2	1135	1115	20		continue
3.	After 40	A1	1121	1120	1	140-145	Dried
		A2	1115	1113	2		

Final Moisture Content (By calculation): A1: 0.7.7%, A2: 0.67%.

Total Wt. Loss: A1- 22 gm.

A2- 23 gm.

2. Trial No. 2:

Microwave Power: 1.8 kW Hot Air Temperature: 70°C Initial Moisture Content: 2.8% Product Quantity: 2 nos. (A3 & A4) Final Moisture Content: A1: 0.7%, A2: 0.67%

Sr.	Cycle time	Sample	Initial Wt.	Final	Total Wt.	Surface	Remarks
No.	(min)	No.	(gm)	Wt. (gm)	Loss (gm)	Temp. (°C)	
1.	After 20	A3	1146	1125	21	100-105	Drying rate
		A4	1148	1129	19		started
2.	After 30	A3	1125	1120	5	130-140	Drying phase
		A4	1129	1123	6		continue
3	After 50	A3	1120	1116	4	.150	Dried
		A4	1123	1118	5		

Final Moisture Content (By Calculation): A1-0.1%, A2-0.1%.

Total Wt. Loss: A1- 30 gm.

A2- 30 gm.

3. Trial No. 3:

Microwave Power: 1.8 kW Hot Air Temperature: 70°C Initial Moisture Content: 2.8%

Product Quantity: 2 nos. (A7 & A8)

Sr. No.	Cycle time (min)	Sample No.	Initial Wt. (gm)	Final Wt. (gm)	Total Wt. Loss (gm)	Surface Temp. (°C)	Remarks
1.	After 45	A7	1145	1115	30	150	Dried
		A8	1139	1110	29		

Final Moisture Content: A1-0.1% (By Calculation)

: A2-0.2% (By moisture analyzer) at core

Total Wt. Loss: A1- 30gm, A2- 29 gm.

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#### THERMAL IMAGE BEFORE AND AFTER HEAT TREATMENT:

a. Trial 1

**Before Heat Treatment:** 



#### **After Heat Treatment:**



b. Trial 2

**Before Heat Treatment:** 



#### **After Heat Treatment:**



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## c. Trial 2

#### **Before Heat Treatment:**



#### **After Heat Treatment:**



### **OBSRVATIONS:**

The Drying behavior of Silica Carbide has been investigated under the Microwave+Covection 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. In the processed sample, as per physical investigation, it has been observed that there is no damage to sample with required amount of drying.

Miss. Komal Bhoite Tested By

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