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Kerone Research & Development Centre (KRDC)
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Batch Microwave + Convection Heat Treatment for Carbon Black

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Customer :	**M/s. PCBL Limited**
Process :	**Batch Microwave + Convection Heat Treatment for Carbon Black**

Test Report No*: *135/KRDC/LAB/17 Mum 05/09/2022

Date Sample reception : 25/06/2022
ID : 135/LAB/05

***Sample Description*:**

Sampling : As Requested
Sample Condition : Acceptable
Sampling date : 05/09/2022
Product : Carbon Black (Fine Powder)
Requirement : Microwave treatment at 1 kW
Start Date test : 05/09/2022
End Date test : 05/09/2022

Laboratory Experimental System -

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System Specifications -

Microwave Power	1.8 KW (CW)
Frequency	1850 MHz ± 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 System	Single Channel Fiber Optic: Range - 40 to 250°C
Exhaust Power	1 HP
Tray size (width*height*depth)	450*950*50 mm

Laboratory's Environmental Conditions –

Temperature (degree C)	29.4ºC (±5ºC)
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		**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**
Moisture Analyzer		**Make: Axis Balance** **Description:** **Moisture range: 1%(sample 0.02/0.05g), 0.1% (Sample 0.5/5g), 0.01%(Sample>5g)**

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Procedure of the Experiment -

- The experiment was performed to speed up the heating rate.
- For this experimental run, the given sample was taken in the crucible and placed in MW + Convection heating system with suitable parameters.
- After the heating treatment, the sample was analyzed.

Analytical Results:

SAMPLE – A (Fine Powder)

Trials	Initial Weight	Specifications of Microwave	Cycle Time	Final Weight	Remarks.
1	20 g	Magnetron Power: 1 kW; Set temp.:150ºC	1 min.	20 g	No weight loss. Grey spots and Red spots were observed. 0n product temp- (100-330)ºC
2	20 g	Magnetron Power: 1 kW; Set temp.:150ºC	2 min.	20 g	No weight loss. Grey spots and Red spots were observed. 0n product temp- (290-420)ºC

Before and After the Sample:

Untreated

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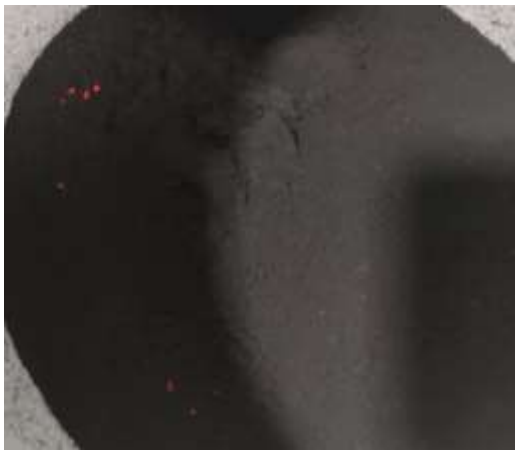
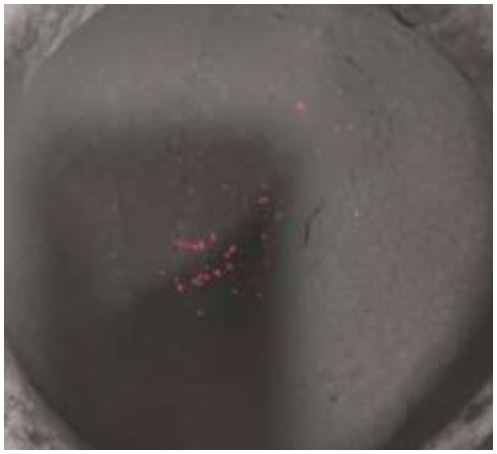


Trial 1 treated (Grey spots)

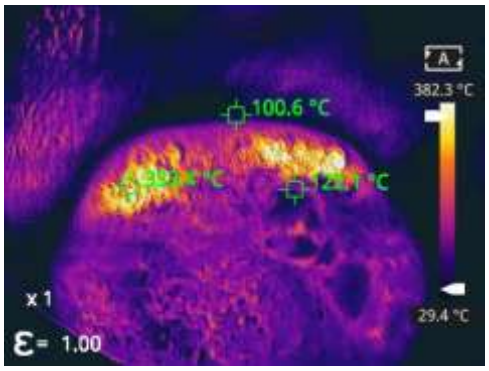


Trial 2 treated (Grey spots)

Thermal images:

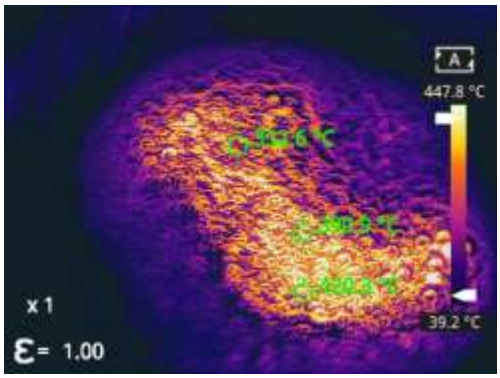
Measurements	
Sp1	100.6°C
Sp2	333.4°C
Sp3	122.1°C

Parameters	
Emissivity	1.00
Temp.	382.3°C



Measurements	
Sp1	352.6°C
Sp2	290.9 °C
Sp3	420.3°C

Parameters	
Emissivity	1.00
Temp.	447.8°C



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Observations:

The drying behavior of Carbon Black has been investigated under the Microwave + Convection heating system. The heating rate is found to be increasing with respect to an increase in time. As per the physical investigation, it has been observed that there is no weight loss after the treatment. Grey spots and red spots (burning effect) after heating the product were observed.

Ms. Sayali Asole
(Tested By)