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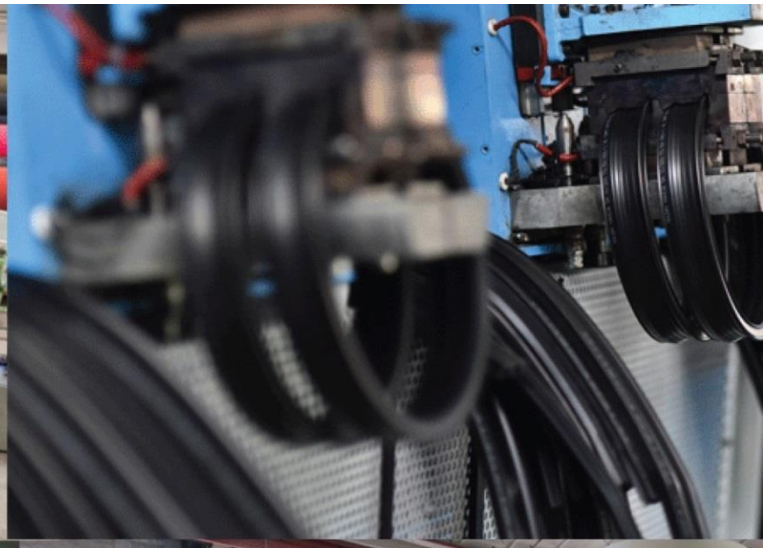

Batch Microwave+Convection Heat Treatment for Drying of Protein Powder

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

MEMBER OF A.M.P.E.R.E (EUROPE)
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Customer :	**Laboratory Experimental Analysis**
Process :	**Batch Microwave+Convection Heat Treatment for Drying of Protein Powder**

TEST REPORT No: 47/KRDC/LAB/17 Mum 17/01/2019

Date Sample reception : 17/01/2019
ID : 47/LAB/83

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Quantity : 1 kg
Sampling date : 21/01/2019
Product : Protein Powder
Requirement : Final product must have moisture content less than 10%
Start Date test : 21/01/2019
End Date test : 21/01/2019

LABORATORY EXPERIMENTAL SET UP:

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LAB BATCH MICROWAVE+CONVECTION HEATING SYSTEM SPECIFICATIONS:

Microwave Power	2 kW(CW)
Frequency	2450 MHz ± 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)	28.5°C (±5°C)
Humidity (%)	≤64% 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
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: ±°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 protein powder with adding water to speed up the drying rate. For this experimental run, protein powder has been mixed with warm water (temperature around 35-40°C) and two samples, Sample A and sample B has been prepared. In sample A, 25 grams of protein powder and 15 ml of water is there and in sample B, 25 grams of protein powder and 20 ml of water. Then this both mixtures has been placed in microwave transparent tray with uniform thickness and placed in microwave heating system for drying treatment. Initial moisture content of protein powder, moisture content of samples A and B and final moisture content has been noted.

ANALYTICAL RESULTS:

Microwave Power: 0.2 kW
Setting Temperature: 40°C
Moisture Content of protein powder: 8.8%
Initial Moisture Content of Sample A: 31.3%

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Initial Moisture Content of Sample B: 44.5%

Sr. No.	Time (minutes)	Moisture Content of Sample A (%)	Moisture Content of Sample B (%)
1.	After 10	24.08	26.32
2.	After 20	18.48	21.97
3.	After 30	13.26	15.20
4.	After 35	9.4	9.8

Final Moisture content of Sample A: 9.4%

Final Moisture content of Sample B: 9.8%

BEFORE AND AFTER PICTURES OF TREATED SPCIMEN SAMPLE:

1. **Sample A:**

2. **Sample B:**

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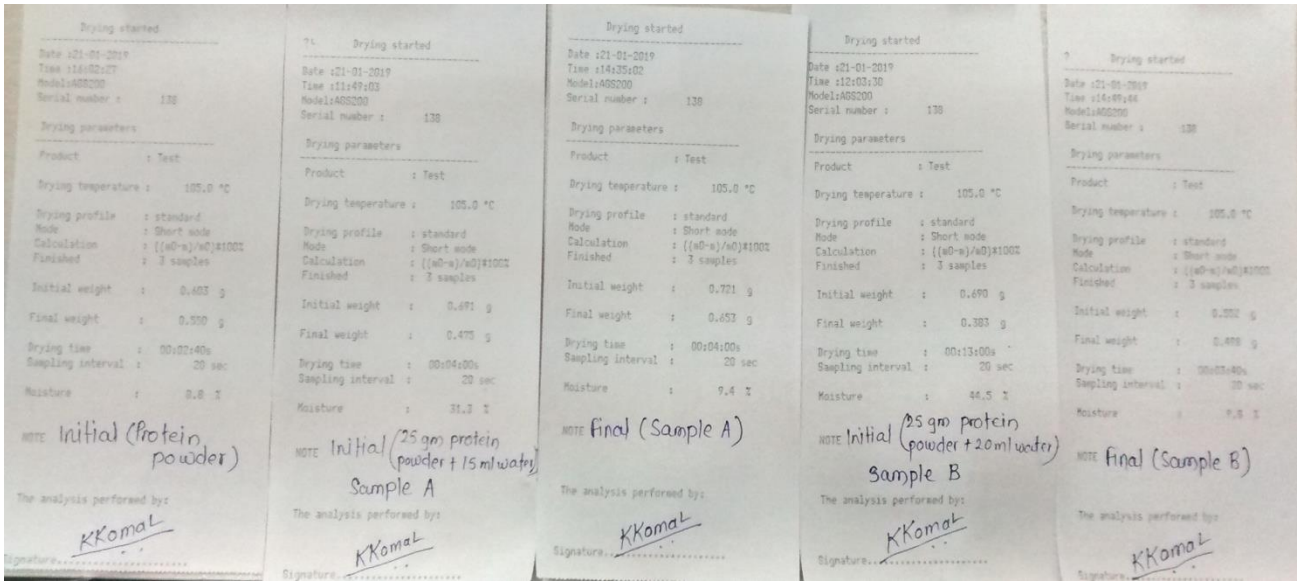
MOISTURE ANALYSIS REPORTS:



OBSRVATIONS:

The Drying behavior of protein powder and water mixture 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 drying with required moisture content without burning effect and there is little colour change.

K Komal

Miss. Komal Bhoite
Tested By