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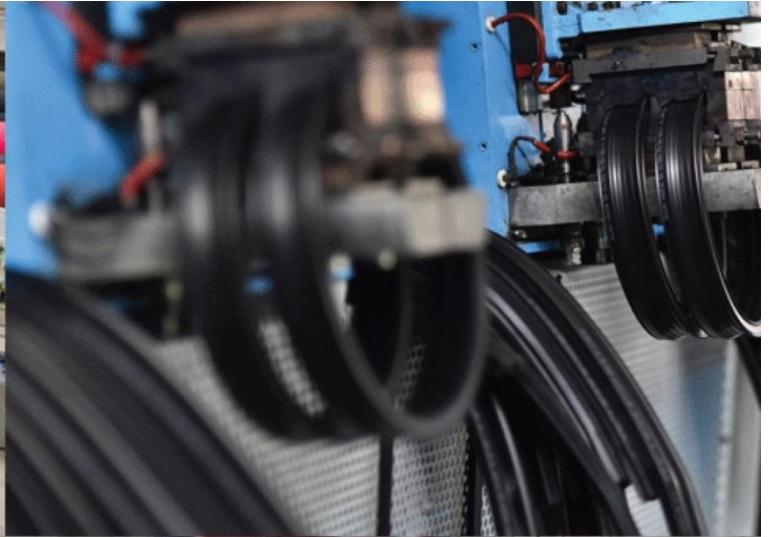
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In Association With



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



**Continuous Infra-red Heat Treatment  
for Evaporation of Ethanol**



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Customer :	M/s. Bhabha Atomic Research Center (BARC), Mumbai
Process :	Evaporation of absolute ethanol on A4 size paper by continuous Infra-red radiation exposure

**TEST REPORT No: 47/KRDC/LAB/17 Mum 07/07/2020**

Date Sample reception : 07/07/2020  
ID : 47/LAB/21

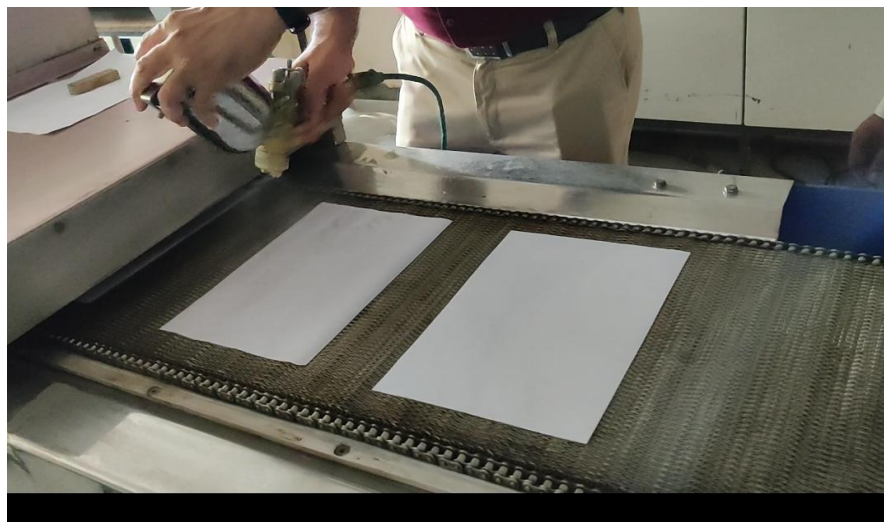
**SAMPLE DESCRIPTION:**

Sampling : As Requested  
Sample Condition : Acceptable  
Quantity : 2 litres of absolute ethanol 99.9 % and 5.37 grams of CNT powder  
Sampling date : 18/09/2020  
Product : Ethanol, CNT Powder and A4 Size paper  
Requirement : Evaporation of ethanol with uniform CNT Coating  
Start Date test : 18/09/2020  
End Date test : 18/09/2020

**LABORATORY EXPERIMENTAL SET UP:**



Format: F/R&D/01



#### LAB CONTINUOUS INFRARED HEATING SYSTEM SPECIFICATIONS:

<b>IR Medium Wave Emitters</b>	6 Nos (-each having 0.5 kW, 445 mm heating length)
<b>Short Wave IR Emitter with special reflectors</b>	6 Nos (-each having 1 kW, 406 mm heating length)
<b>IR Emitter to Object Distance</b>	120 mm (- in medium wave zone)
<b>IR Emitter to Object Distance</b>	100 mm (- in short wave zone)
<b>Overall IR Heating Zone length</b>	1400 mm
<b>Web width</b>	400 mm
<b>IR wavelength range</b>	0.7 to 10 microns
<b>Direct Exposure of MW IR</b>	500 mm
<b>Direct Exposure of SW IR</b>	750mm
<b>Temperature Range</b>	0-400°C

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### ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (degree C)	29°C (±5°C)
Humidity (%)	≤88% RH
Pressure (kN/m <sup>2</sup> 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
Compact Thermal Imaging Camera		Model :FLIR E-30 Resolution: 160x 120IR Thermal sensitivity of 0.10°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: ±°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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### **SAMPLE PREPARATION AND METHOD/PROCEDURE:**

For this experimental run, 500 ml of ethanol and 400 mg of CNT Powder has been taken in a beaker and mixed with the help of the sonicator until the homogeneous mixture has been formed. Then, this homogeneous mixture has been taken in spray gun to coat on A4 size paper and this coated paper fed to Infra-red exposure zone at different temperature and exposure time. The processed paper has been collected at discharge point of heating machine and then recorded the temperature profile of coated film.

### **ANALYTICAL RESULTS:**

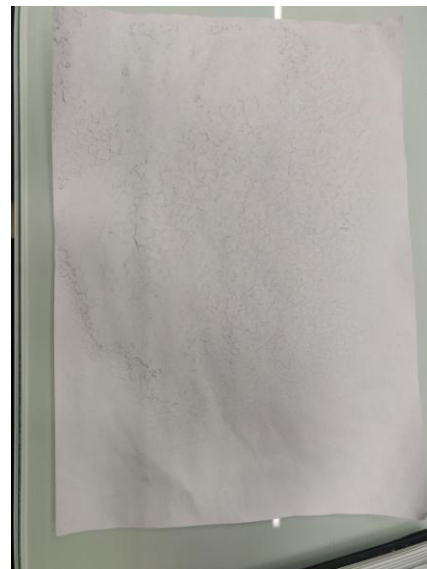
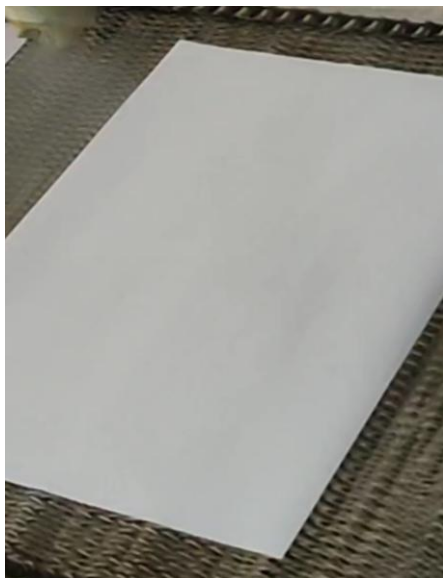
**Setting Temperature: 130°C**

**Emitter Gain: 80 %**

**Time required for Drying: 5 minutes**

**Temperature on the product: 60°C**

### **BEFORE AND AFTER PICTURES OF TREATED SPECIMEN SAMPLE:**





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#### **OBSERVATIONS:**

By the physical investigation, it has been observed that sprayed ethanol film absolutely evaporated, when exposed to Infra-red radiations. But, it is also observed that spray gun used for this experiment is not giving uniform coating.

A handwritten signature in black ink that reads "K Komal".

**Miss Komal Bhoite  
Tested By**