KERONE

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ELECTRO MAGNETIC Innovative Technologies

Kerone Research & Development Centre (KRDC),
B/47, Addl. MIDC. Anand Nagar, Ambernath (East), Thane- 421 506, India
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Batch Infra-Red Heat Treatment of Acrylic Sheets for Malleability Test

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

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Customer :	**M/s. CREST INDUSTRIES**
Process :	**Batch Infra-Red Heat Treatment of Acrylic Sheets for Malleability Test.**

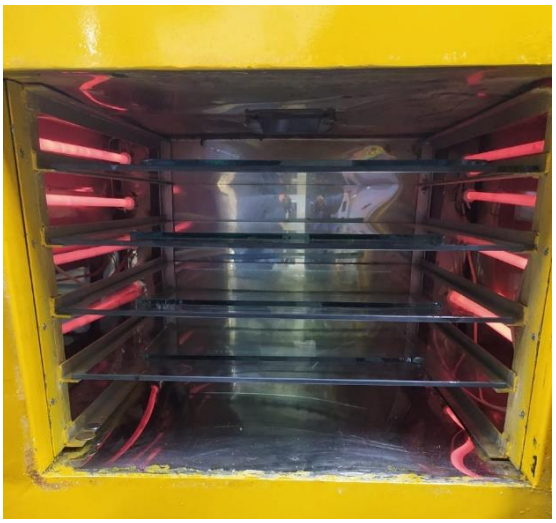
TEST REPORT No: 90/KRDC/LAB/66 Mum 06/07/2022

Date Sample reception : 21/06/2022
ID : 90/LAB/06

SAMPLE DESCRIPTION:

Sampling : As Requested
Sample Condition : Acceptable
Samples opening date : 05/07/2022
Product : Acrylic Sheets
Start Date test : 05/07/2022
End Date test : 05/07/2022

LABORATORY EXPERIMENTAL SETUP:



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LAB IR HEATING SYSTEM SPECIFICATIONS:

IR Medium Wave Emitters	8 Nos (-each having 0.5 kW)
IR wavelength range	0.7 to 10 microns
Temperature Range	0-400^{o}C
Capacity	8kg
Tray size (width*height*depth)	813 x 407 x 30

ENVIRONMENT-LABORATORY AMBIENT CONDITIONS:

Temperature (^{o}C)	26^{o}C (±5^{o}C)
Humidity (%)	≤74% 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 120 IR 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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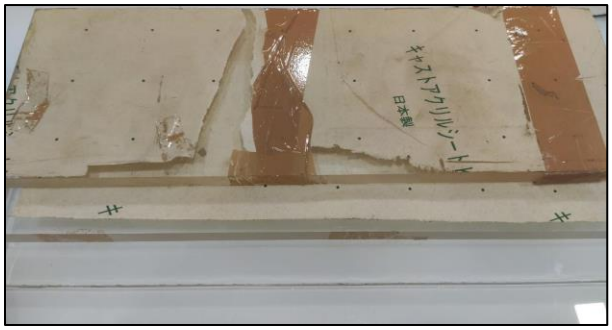
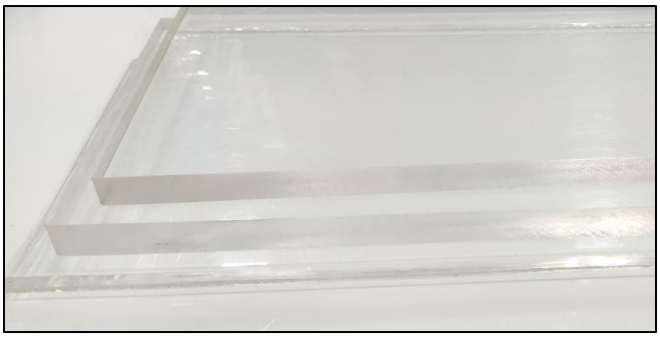
SAMPLE PREPARATION AND METHOD/PROCEDURE:

The experiment has been performed on Acrylic Sheets to speed up its heating rate of the product. For this experimental run, the sample made ready for the trials by removal of protection paper and cleaning the leftover gum properly. Later, it was placed in a Batch IR heating system with suitable set time and temperature profile. The on product temperature and its deformation was observed.





ANALYTICAL RESULTS:

Trial 1

Thickness:10mm thick
Setting Temperature: 170°C
IR Intensity: 70%

Cycle	Cycle Time (min.)	On product Temp. (°C)	Remarks, if any
C1	After 5 mints	(130-135)	Initiation of heating
C2	After 10 mints	(182-184)	Malleability achieved

Total Cycle time- 10 min.

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Trial 2

Thickness:15mm thick
Setting Temperature: 170°C
IR Intensity: 70%

Cycle	Cycle Time (min.)	On product Temp. (°C)	Remarks, if any
C1	After 5 min.	(140-145)	Initiation of heating
C2	After 10 min.	(180-183)	Not easily deforming
C3	After 15 min.	(210-214)	Malleability achieved

Total Cycle time- 15 min.

Trial 3

Thickness:20mm thick
Setting Temperature: 170°C
IR Intensity: 70%

Cycle	Cycle Time (min.)	On product Temp. (°C)	Remarks, if any
C1	After 5 min.	(150-158)	Initiation of heating
C2	After 10 min.	(190-193)	Not easily deforming
C3	After 15 min.	(246-250)	Malleability achieved

Total Cycle time- 15 min.

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MOLDING OF TREATED SPECIMEN SAMPLE:

The molding of the sample after treatment has been done by using a 7" inner Diameter Pipe. The treated sample was inserted inside the pipe and molded into a circular shape.

10mm

15mm

20mm

PICTURES OF TREATED SPECIMEN SAMPLE:

Trial 1

Side view

Top view

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Trial 2

Side view

Top view

Trial 3

Side view

Top view

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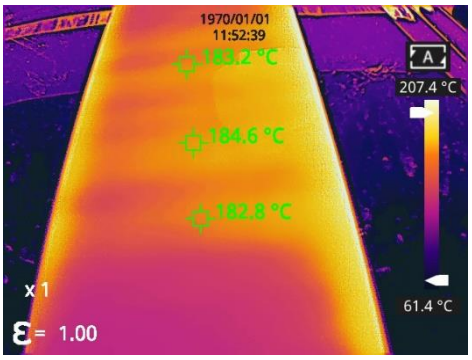
THERMAL ANALYSIS REPORTS:

Measurements

Sp1	183.2°C
Sp2	184.6°C
Sp3	182.8°C

Parameters

Emissivity	1.00
Refl. temp.	207.4°C

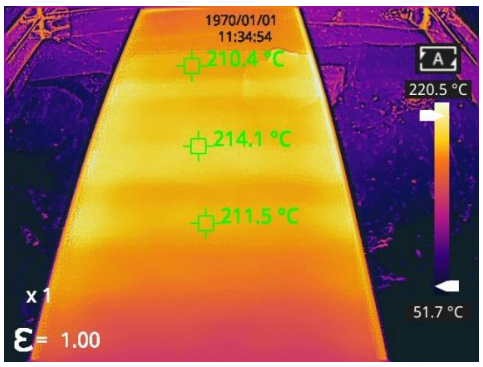


Measurements

Sp1	210.4°C
Sp2	214.1°C
Sp3	211.5°C

Parameters

Emissivity	1.00
Refl. temp.	220.5°C

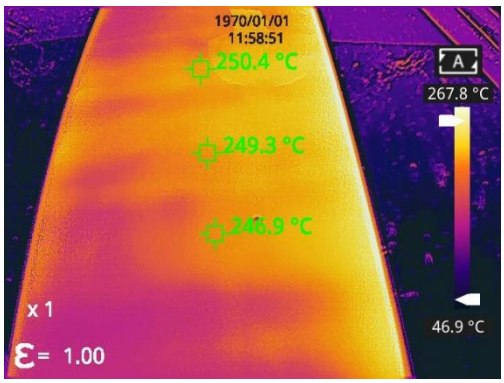


Measurements

Sp1	250.4°C
Sp2	249.3°C
Sp3	246.9 °C

Parameters

Emissivity	1.00
Refl. temp.	267.8°C



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OBSERVATIONS:

The heating behavior of Acrylic sheets has been investigated under the IR heating system. The heating Rate is found to be increasing with respect to increasing heating time. As per physical investigation, it has been observed, that the product of different thickness ranging from 10-20 mm are completely malleable and converted into circular shape by molding the material inside cylindrical pipe after the treatment.

Ms. Sayali Asole
Tested By