



# Final Report

## Determination of UV Cut off wavelength of Encapsulant as per IEC 62788-1-4:2016

MCIND SPVL Report Number: MCIND/21-22/LB/xxxx.V1

Issue Date: 29.09.2021

### Customer

Navitas Alpha Renewables Private Limited

**Address:** Plot No. B-20/21, Road No. 14, Palsana-Baleshwar Rd, Hoziwala Industrial Estate, Sachin, Surat, Gujarat 394230.

### Contact Person

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### Laboratory

Solar PV Laboratory

Mitsui Chemicals India Private Limited

**Lab Address:** Plot no. 5 & 6, Swastik Industrial Estate, Sarkhej-Bavla Highway, Village: Sari, Tal: Sanand, Ahmedabad  
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Lab Management:

Mr. Puneet Kumar – Lab Manager

Mr. Ganesh Gowri – Technical Manager

**Report details**

Report number	MCIND/21-22/LB/xxxx.V1	Order date	24-08-2021
Order number	MCIND/20-21/017.V1	Sample Receive Date	20-08-2021
Test start Date:	06-09-2021	Test end date:	25-09-2021

**Customer Information**

Customer	Navitas Alpha Renewables Private Limited	Street address	Plot No. B-20/21, Road No. 14, Palsana-Baleswar Rd, Hoziwala Industrial Estate, Sachin, Surat, Gujarat 394230
Responsible person	Anil Deshmukh	City / State	Gujarat
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E-Mail	anil.deshmukh@navitasalpha.com	Country	INDIA

**Lab information**

Lab	Mitsui Chemicals India Pvt Ltd	Street address	Plot no. 5 & 6, Swastik Industrial Estate, Sarkhej-Bavla Highway, Village:Sari, Tal: Sanand, Ahmedabad
Responsible engineer	Shubham Kumar	City / State	Ahmedabad, Gujarat
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E-mail	Shubham.kumar@mitsuichemicals.com	Country	INDIA

**Signatures**

<b>Prepared By</b>	<b>Mr. Shubham Kumar</b>	<b>Authorized and Issued by</b>	<b>Mr. Gowri Ganesh</b>
<b>Checked by</b>	<b>Mr. Mayur Nakarani</b>		

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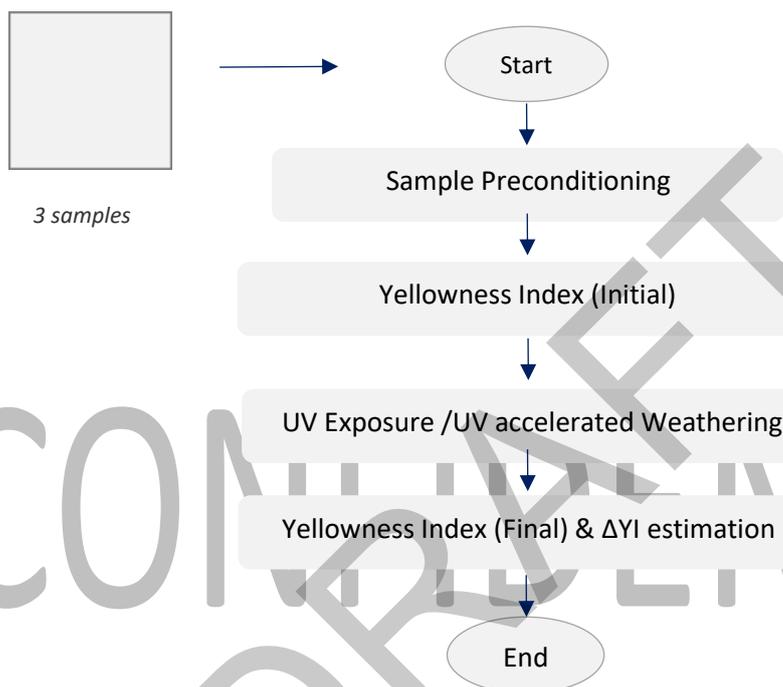
## 1 General Information about the Report

### 1.1 Order

The objective of the project is to evaluate optical transmittance characteristics of encapsulant material intended to be used for PV module application.

### 1.2 Approach

MCIND received 3 nos. of Glass-EVA-Glass sample from Navitas Alpha Renewables Pvt. Ltd. model type EVO FCP UVB for which the following test sequence was agreed:



### 1.3 List of abbreviations and symbols used

Abbreviation/symbol	Particulars
EVA	Ethylene Vinyl Acetate
N/A	Not applicable
IEC	International Electrotechnical Commission
RH	Relative Humidity
nm	Nano meter
$\zeta$	transmittance
Std. Dev, $\pm\sigma$	Standard deviation
Meas.	Measurement
$\lambda_{nm}$	Wavelength in nano meter

## 2 General Information about the Test and Test Objects

### 2.1 Delivery Condition



Figure 2-1 (A) Delivery condition (dated:24-08-2021)

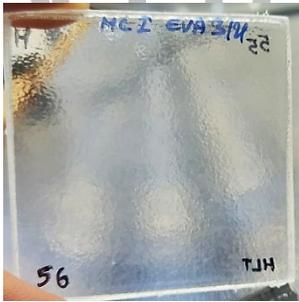
\* **Delivery Condition:** No physical damage of the test samples observed.

\* **Packaging comments:** Test samples are packing is acceptable

**Location:** Gate no. 4 , Solar PV Laboratory, Mitsui chemicals India Pvt. Ltd., Ahmedabad, Gujarat 382220.

**Note:** The PV modules received are Freshly Manufactured samples (as confirmed by the customer.)

### 2.2 Sample Description

Details of Sample			
<b>Make</b>	: Navitas alpha Renewables Pvt. Ltd.		Sample photograph
<b>Encapsulant material</b>	: EVA		
<b>Model no.</b>	: EVO UVB		
<b>Thickness of Encapsulant used (in mm)</b>	: 0.5 ± 5%		
<b>Overall Sample Thickness including Superstrate/substrate (in mm)</b>	: 6.42 ± 0.015 mm		
Specification of Superstrate – Substrate Material used			
Parameters	Superstrate	Substrate	Unit
<b>Material</b>	: Low Iron solar Textured glass	Low Iron solar Textured glass	-
<b>Make</b>	: Borosil Renewables Limited	Borosil Renewables Limited	-
<b>Model type</b>	: Matt	Matt	-
<b>Dimension (l×b×t) in mm</b>	: 3.2×50×50	3.2×50×50	mm
<b>Details of Coating</b>	: N/A	N/A	-
<b>Transmittance %*</b>	: >91	>91	%
<b>Reflectance %*</b>	: 8.0	8.0	%
Test Specimen details			
MCIND Serial Number	Product (Identification) No.	Dimension (l×b) in mm	Tested
Uvb27/21			✓
19/21			✓
20/21			✓
21/21			✓

\*as per Manufacturer datasheet/declaration (see Annex I&II)

### 3 Performed Tests

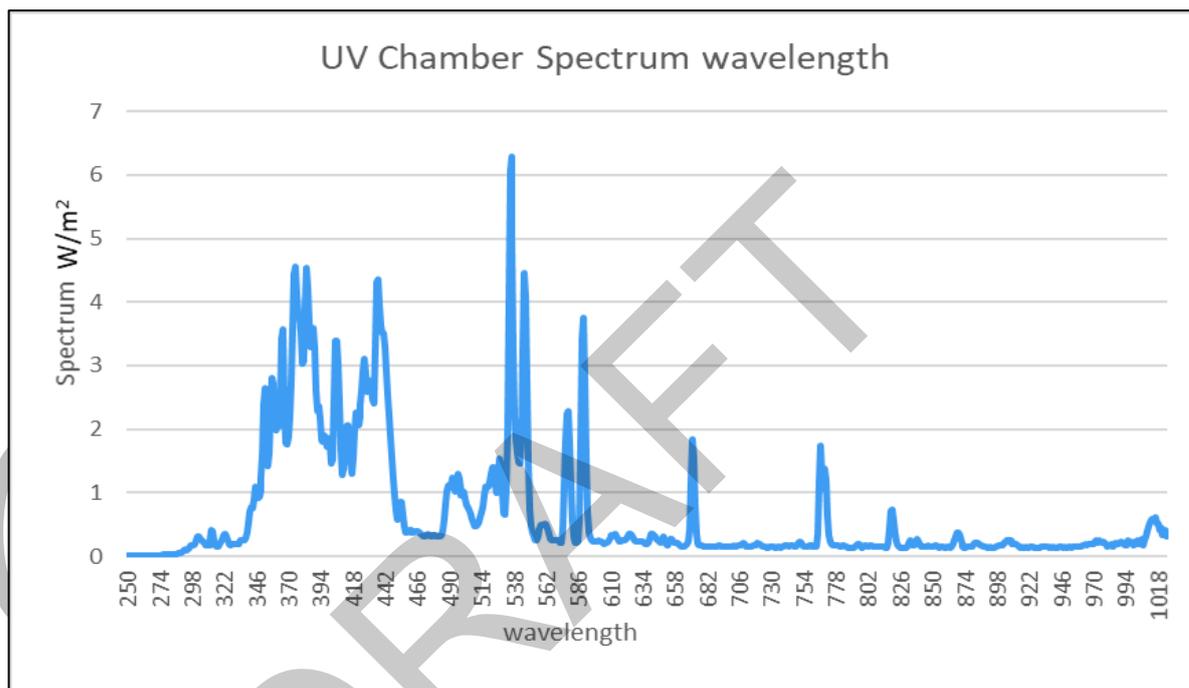
#### 3.1 Test Description

##### 3.1.1 UV Exposure

**Standard:**

The test is carried out in accordance with the procedure mentioned in MQT 10 of IEC 61215-2:2021.

**Spectrum of Lamp used for UV Exposure:**



**Temperature of sample:** 60°C ± 5°C

**Lamp Specification:** UV lamp = 2000 Watts (UVA+UVB), UVA = 74.54%, UVB = 22.24%

**Dosage:** 60 kWh/m<sup>2</sup> (15 kWh/m<sup>2</sup> \*4)

Uniformity (%) of lamp intensity of the UV chamber	8.36
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**Location:** Environmental Test Zone, Mitsui Chemicals India Pvt. Ltd. - Solar PV Laboratory, Ahmedabad, Gujarat 382220, INDIA

**Location Type:** Permanent

<b>Test &amp; Operations Engineer:</b>	<b>Shubham Kumar</b>	<b>Date of Test (DD/MM/YYYY)</b>	<b>Start : -09-2021</b>
			<b>End:</b>

### 3.1.2 Yellowness Index

**Standard:**

The test is carried out in accordance with measurement procedure of Yellowness Index in IEC 62788-1-4:2016 for Encapsulant.

**Purpose:**

To determine the Yellowness Index, (deviation in chroma from colourless or whiteness toward yellow) of the test specimen perceived by a human observer.

**Sample Preconditioning**

Test samples were maintained at  $23\pm 2^{\circ}\text{C}$  and  $50\pm 5\%RH$  for at least 24 h prior to optical measurement.

**Environmental conditions**

Test are conducted at an ambient Temperature conditions of  $23\pm 2^{\circ}\text{C}$  and Relative Humidity  $50\pm 5\%RH$ .

**Test Procedure:**

For conducting the testing, Measurement procedure mentioned under relevant sections of IEC 62788-1-4:2016 has been followed. For Yellowness Index measurement spectrophotometer with CIE standard D65 illuminant spectrum as in ISO 11664-2 and the CIE 1964 XYZ colour space (for human observer with a  $10^{\circ}$  field of view, as in ISO 11664-1). YI is calculated for a wavelength increment eg. 1nm consistent with measured transmittance data.

**Location:** Material testing lab, Mitsui Chemicals India Pvt. Ltd. - Solar PV Laboratory, Ahmedabad, Gujarat 382220, INDIA

**Location Type:** Permanent

<b>Test &amp; Operations Engineer:</b>	Shubham Kumar	<b>Date of Test (DD/MM/YYYY)</b>	23-09-2021
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### 3. 2. Detailed Test Results

#### 3.2.1 Test Result - Yellowness Index measurement

Manufacturer		Navitas Alpha			Product No.				
Model Type		EVO FCP UVB			MCIND Serial No.		MCIND EVA 19/21		
Lamp observer source		D65 10 deg							
Trial Number	Initial/Reference				Final After UV exposure				$\Delta YI$
	L*	a*	b*	YI_E313_D65 Initial [A]	L*	a*	b*	YI_E313_D65 After UV exposure 60 kwh/m <sup>2</sup> [B]	
1	84.84	-1.17	2.11	3.38	83.97	-1.23	2.89	4.99	1.61
2	84.84	-1.17	2.11	3.38	84.27	-1.24	2.88	4.96	1.58
3	84.84	-1.17	2.11	3.38	86.27	-1.20	2.92	4.98	1.60

Manufacturer		Navitas Alpha			Product No.				
Model Type		EVO FCP UVB			MCIND Serial No.		MCIND EVA 20/21		
Lamp observer source		D65 10 deg							
Trial Number	Initial/Reference				Final After UV exposure				$\Delta YI$
	L*	a*	b*	YI_E313_D65 Initial [A]	L*	a*	b*	YI_E313_D65 After UV exposure 60 kwh/m <sup>2</sup> [B]	
1	84.79	-1.14	2.11	3.40	84.61	-1.25	2.74	4.63	1.23
2	84.79	-1.14	2.11	3.40	84.57	-1.26	2.78	4.70	1.30
3	84.79	-1.14	2.11	3.40	84.33	-1.29	2.77	4.67	1.27

Manufacturer		Navitas Alpha			Product No.				
Model Type		EVO FCP UVB			MCIND Serial No.		MCIND EVA 21/21		
Lamp observer source		D65 10 deg							
Trial Number	Initial/Reference				Final After UV exposure				$\Delta YI$
	L*	a*	b*	YI_E313_D65 Initial [A]	L*	a*	b*	YI_E313_D65 After UV exposure 60 kwh/m <sup>2</sup> [B]	
1	84.54	-1.21	2.14	3.42	84.76	-1.26	2.81	4.76	1.34
2	84.54	-1.21	2.14	3.42	84.61	-1.23	2.86	4.90	1.48
3	84.54	-1.21	2.14	3.42	84.58	-1.22	2.85	4.89	1.47

----- End of Test Report -----

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