

EVALUATING THE COMPATIBILITY STUDIES OF SEALANTS ON LACQUERED GLASS & MIRROR

Submitted in partial fulfilment of the requirements for the award of
Bachelor of Technology degree in Chemical Engineering

by

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DEPARTMENT OF CHEMICAL ENGINEERING

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade “A” by NAAC

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OCTOBER-2022



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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **Thirugnanam M (39690020)** who carried out this Project entitled **"Evaluating the compatibility studies of sealants on lacquered glass & mirror"** under my supervision from July 2022 to October 2022.

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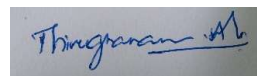
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DECLARATION

I, **Thirugnanam M (39690020)** hereby declare that this Project Report entitled **“Evaluating the compatibility studies of sealants on lacquered glass & mirror”** done by me under the guidance of **Dr. Annam Renita (Prof, M.Tech., Ph. D)** is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology, degree in Chemical Engineering.

DATE:
PLACE:



THIRUGNANAM M

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THIRUGNANAM M

ABSTRACT

Evaluation of sealants' compatibility with lacquered glass and mirrors is an interesting topic where we could understand how the sealants are binding with the substrates that are selected for this project. Here, substrates are chosen in different shades that are readily available on the market. Those substrates are taken, and uniform sealants are applied, which are going to be tested at room temperature to see how the sealants react with lacquered paints over the period. Another set of samples is taken that is coated with sealants; those samples are kept under high humidity conditions, and the sealants' reactions under those conditions would be seen using a data color spectrophotometer. Evaluation of sealant compatibility using a mirror is done in a cross-cut where silver is exposed to the atmosphere and then covered by the sealant on the coated side. Those prepared samples are kept at room temperature and under high conditions, where the defects were developed by collecting stereomicroscope images over a period of simultaneously preparing a cuprohydrochloric solution in which the prepared samples are introduced to immerse and start the hot plate. Under the hot temperature, how the hot acetic and corrosive solution would react with the prepared samples and how the defects developed within a short period of time are observed in the stereomicroscope.

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CHAPTER 1

INTRODUCTION

1.1 Background

Generally, sealants are the materials that are used at the midpoint of two or more substrates to adhere the substrates and seal against moisture, gases, etc. The most common types of sealants are water-based latex, acrylic, butyl, silicone, polyurethane, polyisobutylenes, etc. This project helps us to choose suitable and compatible sealants for application and to quantify the compatible properties of sealants that are applied to the coating side of lacquered glass and mirrors. Dowsil is a one-component, neutral-curing, medium-modulus silicone sealant intended for weather sealing and structural applications with excellent adhesion to a wide range of materials, including glass, metal, and aluminium. It easily extrudes in any weather and quickly cures at room temperature to produce a durable, flexible silicone rubber seal. It had all temperature gunability, had primerless adhesion upon which it will form a strong bond to most common building components without the use of a primer, had long life reliability on cured sealants that stays elastomeric from -50°C to 150°C without hardening, cracking, or becoming brittle under normal weather conditions, had a low modulus with extension and compression capability up to 50% of the original joint width, had excellent weatherability, and was virtually unaffected by sunlight, rain, snow, ozone, and other chemicals.

CHAPTER 2

LITERATURE SURVEY

2.1 Literature 1

Cao, Y., Sun, Q. W. (2016). Study on the seam treatment of joints of steel structure residential building. Steel Construction, 31(2): 101-104: The expansion joint is to be provided from the foundation to the top floor of the building.

The expansion joint is initially built up to the necessary level on one side, followed by the installation of the fiberboard in the location designated for the expansion joint and construction on the other side. Sealants are used to enclose the fiberboard. therefore, overall. The building's construction is complete. Its purpose is to seal the joint against moisture infiltration and stop the entry of dust, grit, or other foreign materials. It should be easily workable, tintless, non-toxic, and insoluble. Most often, a mastic or hot-applied bituminous sealing compound is employed for this.

2.2 Literature 2

Yang, X., Zhong, X. L. Current Situation and Existing Problems of Waterproofing and Sealing for Prefabricated Building External Walls J. (2016) China Building Waterproofing, 12: 16- 18: Sealant and PC external wall board have a close relationship, so the sealant needs to meet the following requirements in accordance with the PC outside wall plate's application features. First, it resists displacement and creeps well. For some building walls, which are nonstructural prefabricated external walls, in order to not affect the impact of the earthquake force, can withstand certain resistance in the design of rigid requirements of the plan, to precast wall panels, in a certain degree, due to the effect of expansion and contraction, joint size will be affected to a certain extent, he will be cycle changes.

2.3 Literature 3

Fu, D.S., Wu, J., Sun, J. G. (2019) Progress in Application of Silane Modified Polyether Sealant. Silicone Material, 33(4): 317-320: For several applications in numerous sectors, modified silane adhesives and sealants are the best choices. In addition to sealing seams wherever elasticity is required, such as in parking lots, they are also used to install solar panels, connect side panels of trailers and vehicles like

trucks, and manufacture assembly parts, containers, doors and windows. Given its vast range of benefits, it is understandable why SMP adhesive and sealant systems are so popular. The modified silane systems are available as adhesives and sealants due to the ease with which they can be further modified. The sealants provide watertight and chemical-resistant sealing, whereas the MSP adhesives have outstanding adhesion to a wide range of surfaces. adhesive systems made of silyl modified polymers.

2.4 Literature 4

Wang, X. H., Deng, Y. M., Chen, J. (2019) Fatigue Resistance of Silicone Joint Sealant for Joints with Different Width. *Silicone Material*. 33(2): 119-121: With the help of modern sealant technologies, it is possible to increase the longevity of structures by using a double sealant made up of nearby silicone and polyisobutylene sealants. Due to its inherent qualities, the inner silicone sealant is quite durable, and by covering it with an outside polyisobutylene sealant, fouling caused by the silicone sealant is avoided. This study shows a high correlation between the total sealant depth and the movement intervention of each sealant and the fatigue resistance of double sealant junctions. Additionally, the proposed section dimension parameters make it possible to develop sealants with the right section sizes by improving fatigue resistance prediction.

2.5 Literature 5

Yang, A. K., Xia, L. J., Wu, P. L. (2019) Research Progress of Silane Modified Sealant. *Chinese Journal of Colloid & Polymer*, 3: 142-145: The well-known method for reducing excessive water production in oil fields with high temperatures and low permeability is the use of colloidal silica. But the improper placement of the traditional conformity control systems could result in the loss of important oil reserves. A potential fix for this issue is the Pickering emulsification of silane-modified colloidal silica. This study shows for the first time the use of organophilic micronized phyllosilicate (Cloisite 20) to create an inversion emulsion with silane-modified colloidal silica in a diesel oil phase. To determine if Cloisite 20 particles would be effective Pickering stabilizers, the impact of high shear stirring on the particles properties was investigated. We measured their zeta potential, contact angle, size,

and interfacial tension. Using, the created Pickering-emulsified colloidal silica was described.

2.6 Literature 6

Luo, X. L., Yuan, M. (2017) Study on Application Properties of MS Sealants for External Wall Joints of Prefabricated Building. China Building Waterproofing, 21: 19-23: Modified and regular silicone sealants are currently utilized extensively in prefabricated buildings. The sealant with low tensile modulus and high displacement, particularly in the junction with the structure, becomes the primary joint material. One of the primary trends in building development for the future is prefabricated construction. The application of AAC has drawn increasing attention as a common material in enclosure walls of steel structures. Aerated concrete supporting sealants must have the following performance qualities: (1) Good compatibility and adhesion with the substrate. This need comes from the characteristics of various types of sealants and the specifications for sealants in prefabricated buildings. Because aerated concrete is porous, it must have a sealer with a high level of adhesion in order to prevent oil leaks.

2.7 Literature 7

Ni, Y., Tian, Y. W., Wei, L. J. (2009) Application of polyether sealant modified by silicone in construction. China Building Waterproofing, 12: 25–28: The definition of "modified silicone building sealant" is the most notable change between the 2017 and 2003 versions of the GB/T 14683 standard in terms of the standard's scope of application. "Room temperature cured one-component and multi-component sealants," with silane-terminated polyether as the primary component. At the same time, requirements for alkane plasticizers have been tightened, and specifications for silicone sealants have been established in order to guarantee their quality and prevent the addition of "white oil." The standard adds the R type to the modified silicone sealant and notes that it has stress relaxation properties in accordance with the development of existing prefabricated buildings. In contrast to silicone rubber, which has a mass loss rate of 5%.

CHAPTER 3

AIM & SCOPE

3.1 Objective

Sealants are widely used in construction to prevent fluids and other substances from passing through material surfaces, joints, or openings. They can also avert the passage of air, sound, dust, insects, and so on, as well as acting as a fireproofing component. Since they have strength, stability, flexibility, appearance permanence, solubility, corrosion resistance, and so on, we would go for it. While some sealants have adhesive qualities, they differ from conventional adhesives in that they tend to have lower strength and higher elongation. This means that they can be used more flexibly between substrates with different properties. There are three basic functions of sealants, as follows: 1. Fill a gap between two or more substrates. 2. Form a barrier through which other substances cannot pass. 3. Maintain sealing properties for the anticipated lifetime. Those functions can be achieved by matching the most suitable sealant to the substrate materials. Before going to install the glass at the customer's place, we would be able to tell them which sealants are compatible with selected substrates by conducting an ageing test, which will tell us the real-time application data presentation.

CHAPTER 4

METHODOLOGY

4.1 About the sealants

4.1.1 Dowsil 789

Unsaturated fatty acids treated Calcium Carbonate, Methyltrimethoxysilane 7 N-(3-Trimethoxysilyl) propyl)-1, 2-ethanediamine: Dowsil 789 silicone weatherproofing sealer is a specific, high-performance weather sealing solution for general glazing and weather sealing in curtain walls and building facades. Just a few of its many appealing characteristics include simple application, primerless adhesion, extended life, low modulus, excellent weatherability, and nearly perfect resistance to sunlight, rain, snow, and ozone. It is a single-portion all-purpose neutral-based sealer. Any scenario may easily extrude it, and when left to dry at room temperature, it quickly hardens to provide a strong, flexible silicone rubber seal. In light of compatibility investigations, I decided to use this sealer to repair the glass and mirror.

4.1.2 Dowsil 896:

Octamethyl Cyclotetrasiloxane: Dowsil 896 panelix is a one-component, high-tack, moisture-curing, neutral silicone adhesive. High-performance, high-strength sealant is particularly made to be used for attaching ventilated or non-ventilated façade panels to various sub-frame components. Excellent adherence to metal, glass, aluminium, steel, and building panels. It is non-corrosive, odourless, and ready for use. Additionally, it has outstanding resistance to heat, humidity, and UV radiation. Due to compatibility testing, I choose to use this sealant to repair the glass and mirror.

4.2 Process Flow – Lacquered Glass

4.2.1 Processing images in Lacquered Glass

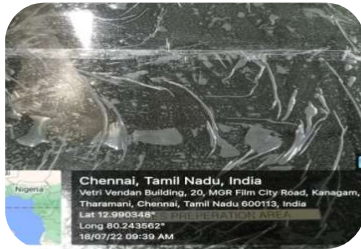


Fig 4.1
Placement of stretch foil



Fig 4.2 Positioning of
substrate



Fig 4.3 Cut down on
sealants



Fig 4.4
Retain the Teflon model



Fig 4.5
Application of sealants



Fig 4.6 Allow 3
days for hardening on the
substrate



Fig 4.7 Baseline data
collected for RT and HH
samples



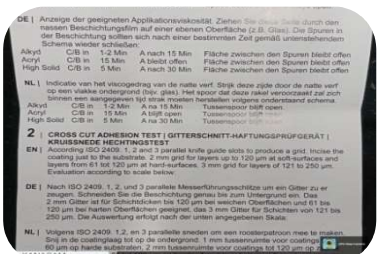
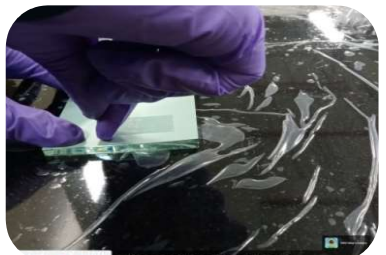
Fig 4.8 A set of samples
was retained in room
condition for 7, 14 and 21
days



Fig 4.9 Another series of
samples aged for 7, 14 & 21
days

4.3 Process Flow – Mirror

4.3.1 Processing images in crosscut test method

 Fig 4.10 Position the thickness gauge	 Fig 4.11 Record the mirror's thickness	 Fig 4.12 Std guide for crosscut
 Fig 4.13 1mm grid for scratch	 Fig 4.14 Applying of std tapes	 Fig 4.15 Removal of the tapes
 Fig 4.16 Repeation of crosscut		

4.3.2 Processing images in mirror

 Fig 4.17 Positioning the scratched sample	 Fig 4.18 Application of sealant	 Fig 4.19 Wiping it uniformly
 Fig 4.20 3 days are needed to treat	 Fig 4.21 Initial microscope image collection	 Fig 4.22 Room conditioning @ 7,14, & 21 days
 Fig 4.23 High humidity conditioning @ 7,14 & 21 days		

4.4 Material Required

4.4.1 Accessories needed for lacquered glass

- Various color shade of lacquered glass. (Each shade – 100*100*5mm)
- Sealants (which is mostly available in market – volume 280ml).
- Sealants gun.
- Spatula.
- Sealants applicator.
- Stretch film.
- Teflon sheet – 300*200*2mm (In that hallow portion need to be cut into 100*200).
- High humidity chamber.
- Data color 550 spectrophotometer.

4.4.2 Accessories needed for mirror

- Mirror (100*100*5mm)
- Sealants (which is mostly available in market).
- Cross Hatch adhesion test kit.
- Sealants gun.
- Spatula.
- Sealants applicator.
- Stretch film.
- Teflon sheet – 300*200*2mm (In that hallow portion need to be cut into 100*200).
- High humidity chamber.
- Optical microscope

4.5 Evaluation Methods

4.5.1 Optical Characterization

4.5.1.1 Colour homogeneity (EN 16477-1:2016):

- The method used here is the L*a*b* colour-space, defined by CIE in 1976 (see EN ISO 11664-4).

- The colour space is one of the most popular method for measuring object colour and is widely used in various fields, because it provides more uniform color differences in relation to visual differences
- The colour of an object depends on the light source.
- The standard illuminant shall be D65 representing the average daylight, and the angle of the observation shall be 10°.
- The measurements shall be undertaken at a minimum of the three points in each evaluated painted glass panel equally distributed.
- The mean value shall be calculated.
- For lacquered glass, DE^* (D65 SCI) (21 DAYS) is < 1.4

4.5.1.2 Colour measurement

One of the most widely used colour spaces for determining object colours is the CIE 1976 $L^*a^*b^*$ colour space, also known as CIELAB. It was established by CIE in 1976 for colour communication and is now widely used for colour management and control across many industries. L^* denotes lightness while a^* and b^* are chromaticity coordinates in the $L^*a^*b^*$ colour space. Color axes a^* and b^* correspond to the red and green axes, the yellow axis, and the blue axis, respectively. The chromaticity of the apple is shown by plotting the a^* and b^* on the colour space, and the lightness of the colour is expressed by the L^* . A company and its customers can communicate in precise colour thanks to the $L^*a^*b^*$ colour space.

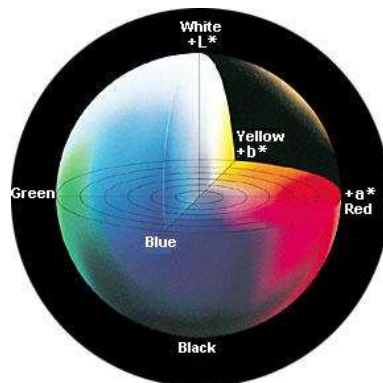
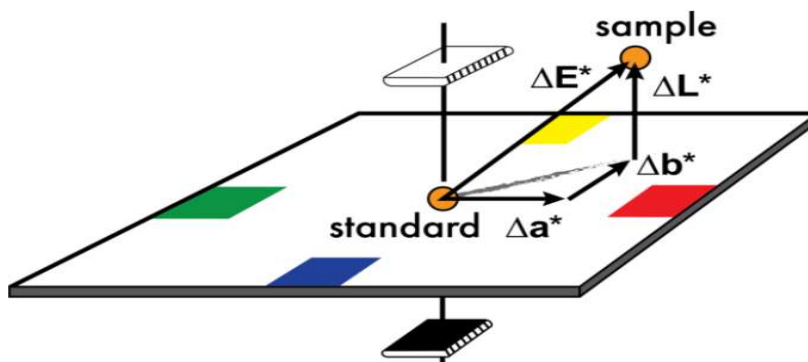


Fig 4.24 Representation of color solid for $L^*a^*b^*$ color space

The color difference between two colors is the distance between the color points of the two colors. ΔE^*_{ab} is the color difference of two colors, '1' and '2', that have color coordinates L^*_1, a^*_1, b^*_1 and L^*_2, a^*_2, b^*_2 , respectively. A small ΔE^*_{ab} value implies that the colors are close to one another. The color difference can be calculated by using the mathematical theorem of Pythagoras. The concept and quantification of color differences is important when a color must be matched or when a new **batch** of a paint must have a color that is close to the color of the standard paint, the **reference**. But, how well must the color of the new batch match with the color of the reference? The answer to this question is a criterion in the quality control of a new batch of paint. The color coordinates of the batch and the reference are measured and the color difference ΔE^*_{ab} is calculated.

$$\Delta E_H = [(L_2 - L_1)^2 + (a_2 - a_1)^2 + (b_2 - b_1)^2]^{1/2}$$



Small differences can have a great impact on the Delta E.

Fig 4.25 Color differences and quantification method

4.5.2 Chemical Characterization

4.5.2.1 High humidity test (EN 16477-1:2016):

- The specimens shall be placed in the testing cabinets with the sealants coating side up.
- Inclination angles shall be between 60 and 75° from the horizontal.
- The test will be conducted at $(40 \pm 3) ^\circ\text{C}$, during 504h.
- Distance from the walls: not less than 100 mm.

- Distance from the bottom edge of the specimens from the surface of the water: not less than 200 mm.
- After the specimens have been positioned and after the climatic chamber has been closed
- Cabinet shall be heated up to the atmospheric temperatures of $(40 \pm 3) ^\circ\text{C}$.
- This temperature shall be attained within 1.5hr
- Condensation water shall be formed on the specimens.
- The samples may be gently rinsed with DI water before examination, evaluation shall be done at least three hours after in order to allow the sample to dry at room temperatures.
- Record the initial and final color values on glass side using data color spectrophotometer, initial and final images using optical microscope.

4.5.2.2 Quick test [cuprohydrochloric salt solution for dissolution]– Mirror

4.5.2.2.1 Corrosive solution preparation

In a 1000 ml beaker, weigh:

- Add 1500 ml of DI water in a borosilicate beaker.
- Add 150 ± 1 g of sodium chloride,
- Add 15 ± 0.1 g of copper chloride.
- Take a stirrer to mix well to reach homogeneous solution.
- Finally add 15 ± 0.1 ml of hydrochloric acid, stirring well.

4.5.2.2.2 Initiation of quick test

- Take prepared samples with two different thicknesses [2mm and 4 mm] and introduce the solution for into the glass tub.
- Heat it to $60^{\circ}\text{C} \pm 5^{\circ}\text{C}$ by using hotplate.
- Immerse the sample which is fully covered by the solution.
- Trigger the stop watch immediately.
- After 1.5hr, remove the samples and visually inspect them.
- Good-if there is no full face attack or $<$ than 2 mm
- Bad –if there is full face attack (Pin hole, generalized corrosion etc.)
- The depth of corrosion is $>$ than 2 mm.

4.5.2.2.3 Process flow - Quick test



Fig 4.26 Initial images collection



Fig 4.27 Solution preparation

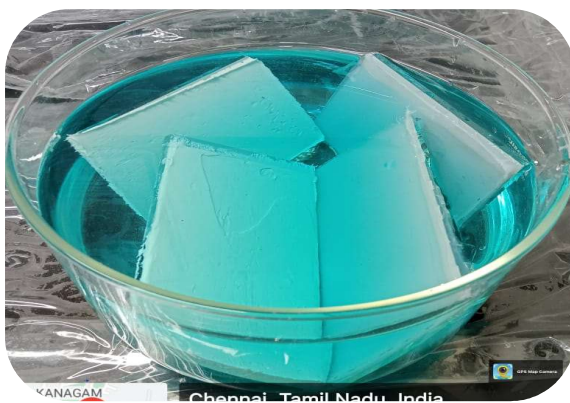


Fig 4.28 Introducing the samples

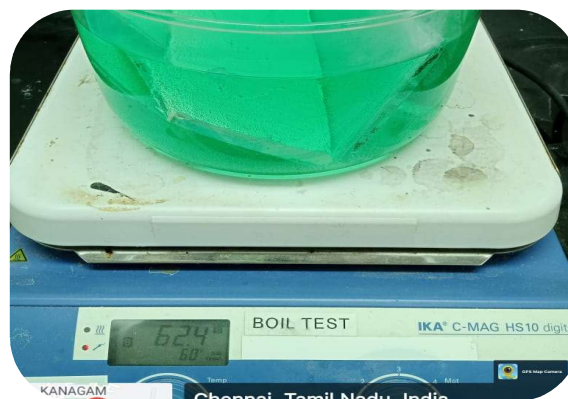


Fig 4.29 Hot plate testing

CHAPTER 5

RESULTS DISCUSSION AND PERFORMANCE ANALYSIS

5.1 COMPATIBLE STUDIES ON LACQUERED GLASS

5.1.1 Room Condition Ageing - dowsil 789

Table 5. 1 Colour value for base data for 9 shades using dowsil 789 in RT

S. No	Sealants coated	L*	a*	b*
1	Extra white	75.88	-0.45	1.89
2	Noir mate black	27.45	-0.27	-0.38
3	Ivory	72.35	1.10	9.24
4	Ultra white	77.40	-1.15	0.26
5	Petal Pink	71.19	4.43	-0.39
6	Fusion orange	51.83	29.43	27.54
7	Lemon Yellow	71.73	-5.79	27.63
8	Titanium Gray	49.31	-0.98	2.32
9	Metallic Grey	72.78	3.23	8.09

Table 5. 2 Colour value for 0 days data for 9 shades using dowsil 789 in RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.87	-0.50	1.83	0.01	0.05	0.06	0.08
2	Noir mate black	27.45	-0.26	-0.39	0.00	-0.01	0.01	0.01
3	Ivory	72.38	1.06	9.19	-0.03	0.0	0.05	0.07
4	Ultra white	77.26	-1.19	0.17	0.1	0.04	0.09	0.17
5	Petal Pink	71.10	4.30	-0.47	0.09	0.13	0.08	0.18
6	Fusion orange	51.83	29.28	27.49	0.00	0.15	0.05	0.16
7	Lemon Yellow	71.67	-5.89	27.34	0.06	0.10	0.29	0.31
8	Titanium Gray	49.37	-0.98	2.36	-0.06	0.00	-0.04	0.07
9	Metallic Grey	72.80	3.24	8.03	-0.02	-0.01	0.06	0.06

Table 5. 3 Colour value for 7 days data for 9 shades using dowsil 789 in RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.90	-0.50	1.79	-0.02	0.05	0.10	0.11

2	Noir mate black	27.65	-0.26	-0.44	-0.20	-0.01	0.06	0.21
3	Ivory	72.43	1.05	9.22	-0.08	0.1	0.02	0.10
4	Ultra white	77.33	-1.20	0.13	0.1	0.05	0.13	0.16
5	Petal Pink	71.20	4.30	-0.53	-0.01	0.13	0.14	0.19
6	Fusion orange	51.91	29.25	27.35	-0.08	0.18	0.19	0.27
7	Lemon Yellow	71.73	-5.91	27.40	0.00	0.12	0.23	0.26
8	Titanium Gray	49.39	-0.98	2.30	-0.08	0.00	0.02	0.08
9	Metallic Grey	72.87	3.24	7.97	-0.09	-0.01	0.12	0.15

Table 5. 4 Colour value for 14 days data for 9 shades using dowsil 789 in RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.91	-0.50	1.79	-0.03	0.05	0.10	0.12
2	Noir mate black	27.67	-0.26	-0.46	-0.22	-0.01	0.08	0.23
3	Ivory	72.41	1.06	9.18	-0.06	0.0	0.06	0.09
4	Ultra white	77.32	-1.20	0.13	0.1	0.05	0.13	0.16
5	Petal Pink	71.15	4.29	-0.56	0.04	0.14	0.17	0.22

6	Fusion orange	51.90	29.22	27.32	-0.07	0.21	0.22	0.31
7	Lemon Yellow	71.71	-5.88	27.39	0.02	0.09	0.24	0.26
8	Titanium Gray	49.40	-0.97	2.29	-0.09	-0.01	0.03	0.10
9	Metallic Grey	72.89	3.25	7.97	-0.11	-0.02	0.12	0.16

Table 5. 5 Colour value for 21 days data for 9 shades using dowsil 789 in RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.98	-0.50	1.78	-0.10	0.05	0.11	0.16
2	Noir mate black	27.68	-0.27	-0.45	-0.23	0.00	0.07	0.24
3	Ivory	72.55	1.07	9.22	-0.20	0.0	0.02	0.20
4	Ultra white	77.39	-1.18	0.13	0.0	0.03	0.13	0.13
5	Petal Pink	71.26	4.29	-0.60	-0.07	0.14	0.21	0.26
6	Fusion orange	51.93	29.23	27.31	-0.10	0.20	0.23	0.32
7	Lemon Yellow	71.72	-5.89	27.39	0.01	0.10	0.24	0.26
8	Titanium Gray	49.42	-0.97	2.29	-0.11	-0.01	0.03	0.11
9	Metallic Grey	72.93	3.25	7.98	-0.15	-0.02	0.11	0.19

5.1.2 High Humidity Ageing – dowsil 789:

Table 5. 6 Colour value for base data for 9 shades using dowsil 789 in HH

S.No	Sealants coated	L*	a*	b*
1	Extra white	75.87	-0.45	1.88
2	Noir mate black	27.42	-0.27	-0.38
3	Ivory	72.43	1.09	9.31
4	Ultra white	77.42	-1.16	0.27
5	Petal Pink	71.18	4.46	-0.39
6	Fusion orange	51.87	29.39	27.61
7	Lemon Yellow	71.73	-5.78	27.51
8	Titanium Gray	49.32	-0.99	2.31
9	Metallic Grey	72.84	3.20	8.06

Table 5. 7 Colour value for 0 days data for 9 shades using dowsil 789 in HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
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1	Extra white	75.89	-0.49	1.84	-0.02	0.04	0.04	0.06
2	Noir mate black	27.48	-0.27	-0.38	-0.06	0.00	0.00	0.06
3	Ivory	72.39	1.06	9.20	0.04	0.03	0.11	0.12
4	Ultra white	77.25	-1.19	0.20	0.17	0.03	0.07	0.19
5	Petal Pink	71.11	4.35	-0.43	0.07	0.11	0.04	0.14
6	Fusion orange	51.87	29.31	27.59	0.00	0.08	0.02	0.08
7	Lemon Yellow	71.72	-5.91	27.27	0.01	0.13	0.24	0.27
8	Titanium Gray	49.41	-0.99	2.35	-0.09	0.00	-0.04	0.10
9	Metallic Grey	72.85	3.21	8.00	-0.01	0.0	0.06	0.06

Table 5. 8 Colour value for 7 days data for 9 shades using dowsil 789 in HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.90	-0.48	1.81	-0.03	0.03	0.07	0.08
2	Noir mate black	27.74	-0.27	-0.45	-0.32	0.00	0.07	0.33
3	Ivory	72.46	1.06	9.21	-0.03	0.03	0.10	0.11
4	Ultra white	77.32	-1.19	0.17	0.10	0.03	0.10	0.14

5	Petal Pink	71.47	4.09	-0.47	-0.29	0.37	0.08	0.48
6	Fusion orange	52.04	29.30	27.47	-0.17	0.09	0.14	0.24
7	Lemon Yellow	71.78	-5.93	27.36	-0.05	0.15	0.15	0.22
8	Titanium Gray	49.37	-0.98	2.26	-0.05	-0.01	0.05	0.07
9	Metallic Grey	72.85	3.22	7.97	-0.01	0.0	0.09	0.09

Table 5. 9 Colour value for 14 days data for 9 shades using dowsil 789 in HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	75.96	-0.48	1.81	-0.09	0.03	0.07	0.12
2	Noir mate black	27.71	-0.27	-0.44	-0.29	0.00	0.06	0.30
3	Ivory	72.49	1.05	9.19	-0.06	0.04	0.12	0.14
4	Ultra white	77.40	-1.19	0.17	0.02	0.03	0.10	0.11
5	Petal Pink	71.32	4.20	-0.49	-0.14	0.26	0.10	0.31
6	Fusion orange	52.02	29.24	27.44	-0.15	0.15	0.17	0.27
7	Lemon Yellow	71.80	-5.92	27.33	-0.07	0.14	0.18	0.24
8	Titanium Gray	49.47	-0.98	2.29	-0.15	-0.01	0.02	0.15

9	Metallic Grey	72.84	3.23	8.03	0.00	0.0	0.03	0.04
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Table 5. 10 Colour value for 21 days data for 9 shades using dowsil 789 in HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	76.08	-0.47	1.81	-0.21	0.02	0.07	0.22
2	Noir mate black	27.64	-0.26	-0.39	-0.22	-0.01	0.01	0.22
3	Ivory	72.60	1.08	9.26	-0.17	0.01	0.05	0.18
4	Ultra white	77.41	-1.19	0.15	0.01	0.03	0.12	0.12
5	Petal Pink	71.38	4.19	-0.51	-0.20	0.27	0.12	0.36
6	Fusion orange	52.00	29.31	27.54	-0.13	0.08	0.07	0.17
7	Lemon Yellow	71.84	-5.94	27.54	-0.11	0.16	-0.03	0.20
8	Titanium Gray	49.40	-0.97	2.28	-0.08	-0.02	0.03	0.09
9	Metallic Grey	72.87	3.24	8.01	-0.03	0.0	0.05	0.07

5.1.3 Final data- dowsil 789

Table 5. 11 Final data for compatible studies on dowsil 789

S.No	Sealants coated	ROOM TEMP [ΔE]				HIGH HUMIDITY [ΔE]			
		0 DAYS	7 DAYS	14 DAYS	21 DAYS	0 DAYS	7 DAYS	14 DAYS	21 DAYS
1	Extra white	0.08	0.11	0.12	0.16	0.06	0.08	0.12	0.22
2	Noir mate black	0.01	0.21	0.23	0.24	0.06	0.33	0.30	0.22
3	Ivory	0.07	0.10	0.09	0.20	0.12	0.11	0.14	0.18
4	Ultra white	0.17	0.16	0.16	0.13	0.19	0.14	0.11	0.12
5	Petal Pink	0.18	0.19	0.22	0.26	0.14	0.48	0.31	0.36
6	Fusion orange	0.16	0.27	0.31	0.32	0.08	0.24	0.27	0.17
7	Lemon Yellow	0.31	0.26	0.26	0.26	0.27	0.22	0.24	0.20
8	Titanium Gray	0.07	0.08	0.10	0.11	0.10	0.07	0.15	0.09
9	Metallic Grey	0.06	0.15	0.16	0.19	0.06	0.09	0.04	0.07

5.1.4 Observation

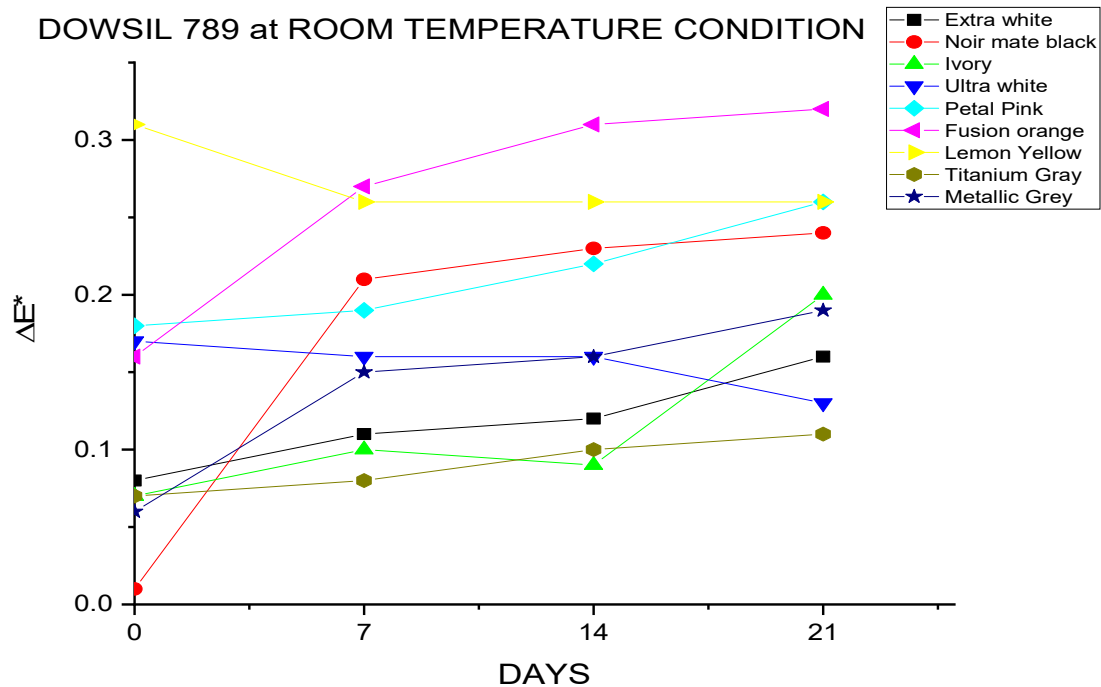
Dowsil 789 was used to apply every colour of the coated lacquered glass, and it was kept at a high humidity and room temperature for up to 21 days (normally, this would take place in a Hygrotherm 512 chamber, where we could control both temperature and humidity). For each lacquered glass, we kept track of a specified range for compatibility, which was still tested when sealants were used. The specified compatibility range of the evaluation methodologies include all colour tones. Table 5.11 shows that there was little colour variation seen during data collection when it was reflected on the glass side in conditions of high humidity and ambient temperature.

Extrawhite: According to table 5.11, the colour differences under room conditions are 0.08, 0.11, 0.12, and 0.16. The graph makes it evident that the incremental ΔE obtained from the experiment increases linearly. The responses under RT appear to be moving slowly. Under high humidity circumstances, the colour values are 0.06, 0.08, 0.12, and 0.22. Which expressly states that there are extremely few reactions between sealant and this colour tone.

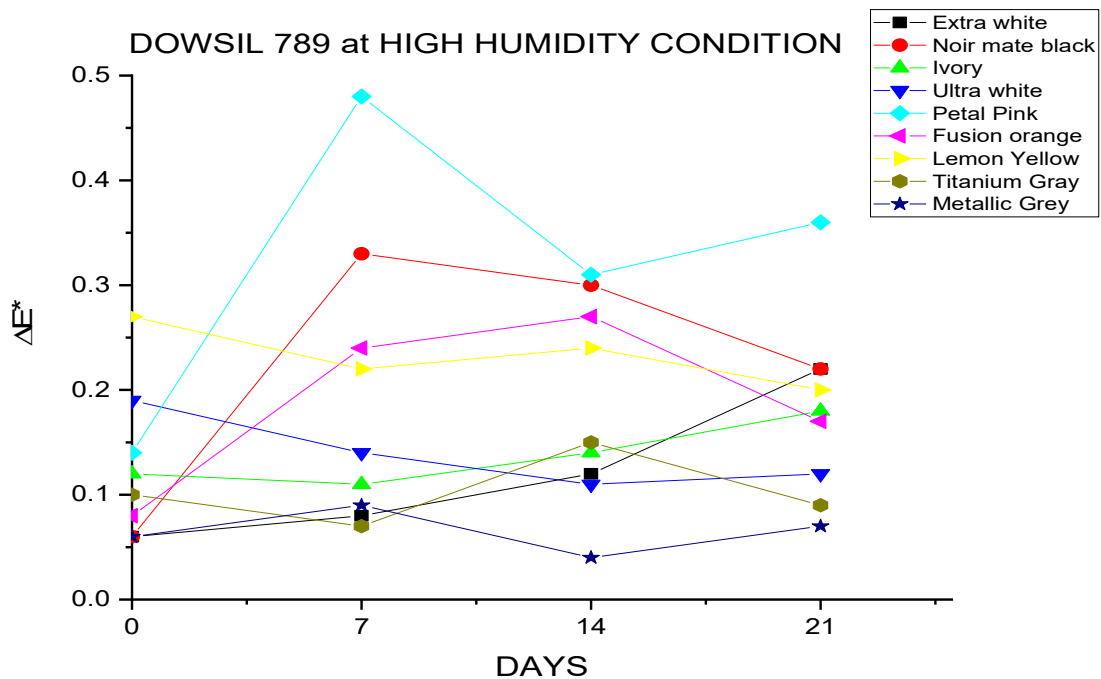
Noir mate Black: According to table 5.11, the colour differences at room temperature are displayed as 0.01, 0.21, 0.23, and 0.24. After a 7-day hiatus, the incremental of the experiment's E value is unexpectedly increased; after that, it moves steadily more slowly. The following colour values are displayed in high humidity conditions: 0.06, 0.03, 0.30, and 0.22. Since the reactions are excessively intense at the 7-day interval, we obtained 0.33, which was thereafter steadily maintained and slowly dropped.

Ivory: According to table 5.11, under standard lighting circumstances, the colour differences are 0.07, 0.10, 0.09, and 0.20. The value obtained from the experimental data, which does not move continuously and varies somewhat in colour at each interval. The colour value variations are displayed under HH as 0, 12, 0, 11, 0, 14, and 0.18. Data looks to be extremely close to beginning at the end of the full time period. In this setting, reactions don't happen very often.

5.1.5 Graph 01 – Dowsil 789 @ RT



5.1.6 Graph 02 – Dowsil 789 @ HH



Ultrawhite: The colour discrepancies are shown as 0.17, 0.16, 0.16, and 0.13 under room circumstances. The data from this colour shade indicates that the dowsil sealant in this environment frequently reacted with it. The values are reported as 0.19, 0.14, 0.11, and 0.12 in addition to the high humidity condition. In this climatic zone, the colour difference first showed as as high as 0.19 before gradually starting to decline.

Petal Pink: The colour differences at room temperature are shown as 0.18, 0.19, 0.22, and 0.26. From the beginning region, the data gradually grew until it reached 0.26 after a 21-day period. In addition, the colour values from areas with significant humidity are 0.14, 0.48, 0.31, and 0.36. Initial information suggests that this is the case. After a 7-day break, there was an unexpectedly high peak of 0.48, where we could witness strong dowsil 789 responses. Later, the response rate gradually dropped until it reached 0.36 at a 21-day interval

Fusion Orange: The colour differences at room temperature are displayed as 0.16, 0.27, 0.31, and 0.32. The results were obtained from the conditioned region, where they first appeared to be quite low (0.16), but after a 7-day delay, they gradually increased and steadily increased to (0.32). We may observe that a high response rate occurred after seven days.

Lemon Yellow: The data at the region of room condition are 0.31, 0.26, 0.26, and 0.26. The initial values began at 0.31. The response rate remained stable afterward. The values obtained at the HH region are 0.27, 0.22, 0.24, and 0.20. The response rate with dowsil 789 is steady in this area with constant humidity.

Titanium Grey: The colour statistics for the room condition region are 0.07, 0.08, 0.10, and 0.11. The response rate is extremely low from the beginning and lasts for up to 21 days. The colour data for the region with high humidity is 0.10, 0.07, 0.15, and 0.09, indicating that the rate of the reaction is too slow.

Metallic Grey: The colour data at the ageing of the room condition are 0.06, 0.15, 0.16, and 0.19. The reactions to sealant have always been gradual since day one.

Along with the HH area, the following numbers always receive the same reaction rate: 0.06, 0.09, 0.04, and 0.07. Room Temperature Ageing - dowsil 896

Table 5. 12 Colour value for base colour for 9 shades using dowsil 896 at RT

S.No	Sealants coated	L*	a*	b*
1	Extra white	80.38	-0.20	2.25
2	Noir mate black	27.50	-0.24	-0.32
3	Ivory	77.08	1.88	11.17
4	Ultra white	82.54	-1.17	0.26
5	Petal Pink	76.14	6.19	-1.41
6	Fusion orange	53.91	34.48	31.06
7	Lemon Yellow	76.73	-5.47	31.61
8	Titanium Gray	50.26	-0.62	1.99
9	Metallic Grey	74.70	3.82	7.90

Table 5. 13 Colour value for 0 days data for 9 shades using dowsil 896 at RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.54	-0.15	2.29	-0.16	-0.05	-0.04	0.17
2	Noir mate black	27.51	-0.24	-0.33	-0.01	0.00	0.01	0.01

3	Ivory	77.14	1.90	11.22	-0.06	0.0	-0.05	0.08
4	Ultra white	82.77	-1.07	0.46	-0.2	-0.10	-0.20	0.32
5	Petal Pink	76.17	6.30	-1.40	-0.03	-0.11	-0.01	0.11
6	Fusion orange	54.10	34.31	31.07	-0.19	0.17	-0.01	0.26
7	Lemon Yellow	76.82	-5.36	31.77	-0.09	-0.11	-0.16	0.21
8	Titanium Gray	50.27	-0.61	1.98	-0.01	-0.01	0.01	0.02
9	Metallic Grey	74.75	3.81	7.88	-0.05	0.01	0.02	0.05

Table 5. 14 Colour value for 7 days data for 9 shades using dowsil 896 at RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.40	-0.14	2.28	-0.02	-0.06	-0.03	0.07
2	Noir mate black	27.46	-0.19	-0.35	0.04	-0.05	0.03	0.07
3	Ivory	77.07	1.91	11.20	0.01	0.0	-0.03	0.04
4	Ultra white	82.68	-1.05	0.45	-0.1	-0.12	-0.19	0.26
5	Petal Pink	76.19	6.32	-1.43	-0.05	-0.13	0.02	0.14
6	Fusion orange	54.03	34.30	31.03	-0.12	0.18	0.03	0.22
7	Lemon Yellow	76.77	-5.37	31.70	-0.04	-0.10	-0.09	0.14
8	Titanium Gray	50.19	-0.61	1.99	0.07	-0.01	0.00	0.07
9	Metallic Grey	74.69	3.82	7.86	0.01	0.00	0.04	0.04

Table 5. 15 Colour value for 14 days data for 9 shades using dowsil 896 at RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.53	-0.15	2.33	-0.15	-0.05	-0.08	0.18
2	Noir mate black	27.47	-0.22	-0.32	0.03	-0.02	0.00	0.04
3	Ivory	77.21	1.91	11.26	-0.13	0.0	-0.09	0.16
4	Ultra white	82.78	-1.07	0.49	-0.2	-0.10	-0.23	0.35
5	Petal Pink	76.21	6.30	-1.36	-0.07	-0.11	-0.05	0.14
6	Fusion orange	54.14	34.35	31.11	-0.23	0.13	-0.05	0.27
7	Lemon Yellow	76.86	-5.38	31.82	-0.13	-0.09	-0.21	0.26
8	Titanium Gray	50.26	-0.61	2.00	0.00	-0.01	-0.01	0.01
9	Metallic Grey	74.73	3.82	7.91	-0.03	0.00	-0.01	0.03

Table 5. 16 colour value for 21 days data for 9 shades using dowsil 896 at RT

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.46	-0.16	2.29	-0.08	-0.04	-0.04	0.10
2	Noir mate black	27.46	-0.22	-0.31	0.04	-0.02	-0.01	0.05
3	Ivory	77.08	1.89	11.17	0.00	0.0	0.00	0.01

4	Ultra white	82.68	-1.07	0.46	-0.1	-0.10	-0.20	0.26
5	Petal Pink	76.15	6.27	-1.39	-0.01	-0.08	-0.02	0.08
6	Fusion orange	54.08	34.30	31.07	-0.17	0.18	-0.01	0.25
7	Lemon Yellow	76.77	-5.39	31.76	-0.04	-0.08	-0.15	0.17
8	Titanium Gray	50.21	-0.61	1.99	0.05	-0.01	0.00	0.05
9	Metallic Grey	74.72	3.81	7.88	-0.02	0.01	0.02	0.03

5.1.7 High humidity Ageing - dowsil 896

Table 5. 17 Colour value for base colour for 9 shades using dowsil 896 at HH

S.No	Sealants coated	L*	a*	b*
1	Extra white	80.37	-0.20	2.24
2	Noir mate black	27.63	-0.25	-0.27
3	Ivory	77.09	1.87	11.22
4	Ultra white	82.54	-1.16	0.25
5	Petal Pink	76.13	6.23	-1.36
6	Fusion orange	55.09	36.34	32.22
7	Lemon Yellow	76.75	-5.46	31.66
8	Titanium Gray	50.29	-0.61	2.00

9	Metallic Grey	74.72	3.83	7.90
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Table 5. 18 colour value for 0 days data for 9 shades using dowsil 896 at HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.51	-0.14	2.31	-0.14	-0.06	-0.07	0.17
2	Noir mate black	27.64	-0.23	-0.27	-0.01	-0.02	0.00	0.02
3	Ivory	77.15	1.90	11.25	-0.06	-0.03	-0.03	0.07
4	Ultra white	82.81	-1.08	0.45	-0.27	-0.08	-0.20	0.35
5	Petal Pink	76.18	6.36	-1.33	-0.05	-0.13	-0.03	0.14
6	Fusion orange	55.42	35.83	32.24	-0.33	0.51	-0.02	0.61
7	Lemon Yellow	76.87	-5.38	31.83	-0.12	-0.08	-0.17	0.22
8	Titanium Gray	50.30	-0.62	2.01	-0.01	0.01	-0.01	0.02
9	Metallic Grey	74.73	3.82	7.88	-0.01	0.0	0.02	0.02

Table 5. 19 Colour value for 7 days data for 9 shades using dowsil 896 at HH

S.No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.44	-0.14	2.28	-0.07	-0.06	-0.04	0.10
2	Noir mate black	27.60	-0.21	-0.27	0.03	-0.04	0.00	0.05

3	Ivory	77.11	1.89	11.22	-0.02	-0.02	0.00	0.03
4	Ultra white	82.68	-1.07	0.42	-0.14	-0.09	-0.17	0.24
5	Petal Pink	76.13	6.26	-1.31	0.00	-0.03	-0.05	0.06
6	Fusion orange	55.34	35.94	32.25	-0.25	0.40	-0.03	0.47
7	Lemon Yellow	76.83	-5.39	31.77	-0.08	-0.07	-0.11	0.15
8	Titanium Gray	50.25	-0.61	2.01	0.04	0.00	-0.01	0.04
9	Metallic Grey	75.58	2.72	6.47	-0.86	1.1	1.43	2.00

Table 5. 20 Colour value for 14 days data for 9 shades using dowsil 896 at HH

S. No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.58	-0.16	2.32	-0.21	-0.04	-0.08	0.23
2	Noir mate black	27.64	-0.22	-0.25	-0.01	-0.03	-0.02	0.04
3	Ivory	77.30	1.90	11.27	-0.21	-0.03	-0.05	0.22
4	Ultra white	82.84	-1.10	0.47	-0.30	-0.06	-0.22	0.38
5	Petal Pink	76.23	6.20	-1.28	-0.10	0.03	-0.08	0.13
6	Fusion orange	55.18	36.35	32.33	-0.09	-0.01	-0.11	0.14
7	Lemon Yellow	76.89	-5.39	31.85	-0.14	-0.07	-0.19	0.25
8	Titanium Gray	50.29	-0.62	2.03	0.00	0.01	-0.03	0.03
9	Metallic Grey	75.63	2.71	6.50	-0.91	1.1	1.40	2.01

Table 5. 21 Colour value for 21 days data for 9 shades using dowsil 896 at HH

S. No	Sealants coated	L*	a*	b*	DL	DA	DB	ΔE
1	Extra white	80.49	-0.16	2.30	-0.12	-0.04	-0.06	0.14
2	Noir mate black	27.62	-0.23	-0.24	0.01	-0.02	-0.03	0.04
3	Ivory	77.12	1.88	11.19	-0.03	-0.01	0.03	0.04
4	Ultra white	82.73	-1.09	0.43	-0.19	-0.07	-0.18	0.27
5	Petal Pink	76.19	6.14	-1.29	-0.06	0.09	-0.07	0.13
6	Fusion orange	55.35	35.93	32.24	-0.26	0.41	-0.02	0.49
7	Lemon Yellow	76.87	-5.41	31.88	-0.12	-0.05	-0.22	0.26
8	Titanium Gray	50.26	-0.62	2.03	0.03	0.01	-0.03	0.04
9	Metallic Grey	75.63	2.71	6.49	-0.91	1.1	1.41	2.02

5.1.8 Final data- dowsil 896

Table 5. 22 Final data for compatible studies on dowsil 896

S. No	Sealants coated	ROOM TEMP [ΔE]				HIGH HUMIDITY [ΔE]			
		0 DAYS	7 DAYS	14 DAYS	21 DAYS	0 DAYS	7 DAYS	14 DAYS	21 DAYS
1	Extra white	0.17	0.07	0.18	0.10	0.17	0.10	0.23	0.14
2	Noir mate black	0.01	0.07	0.04	0.05	0.02	0.05	0.04	0.04

3	Ivory	0.08	0.04	0.16	0.01	0.07	0.03	0.22	0.04
4	Ultra white	0.32	0.26	0.35	0.26	0.35	0.24	0.38	0.27
5	Petal Pink	0.11	0.14	0.14	0.08	0.14	0.06	0.13	0.13
6	Fusion orange	0.26	0.22	0.27	0.25	0.61	0.47	0.14	0.49
7	Lemon Yellow	0.21	0.14	0.26	0.17	0.22	0.15	0.25	0.26
8	Titanium Gray	0.02	0.07	0.01	0.05	0.02	0.04	0.03	0.04
9	Metallic Grey	0.05	0.04	0.03	0.03	0.02	2.00	2.01	2.02

5.1.9 Observation

All of the coated lacquered glass' colour shades were treated with Dowsil 896, which was held at high humidity and room temperature for up to 21 days (normally, this would take place in a Hygrotherm 512 chamber, where we could control both temperature and humidity). We maintained a certain range for compatibility properties for each planilaque, which would be examined even if sealants were applied. Metallic Grey is the only colour difference that was seen during data collection in a room with a high humidity level. The dowsil 896 pigment reacts with the metallic grey colour shade to produce a reflective surface on the glass, as seen in table 5.22. This colour hue is inappropriate for environments with significant humidity.

Extrawhite: According to table 5.22, the colour differences under room conditions are 0.17, 0.07, 0.18, and 0.10. The graph makes it evident that the incremental of the ΔE obtained from the experiment appears to be maintained continuously. Under high humidity circumstances, the colour values are 0.17, 0.10, 0.23, and 0.14. This makes

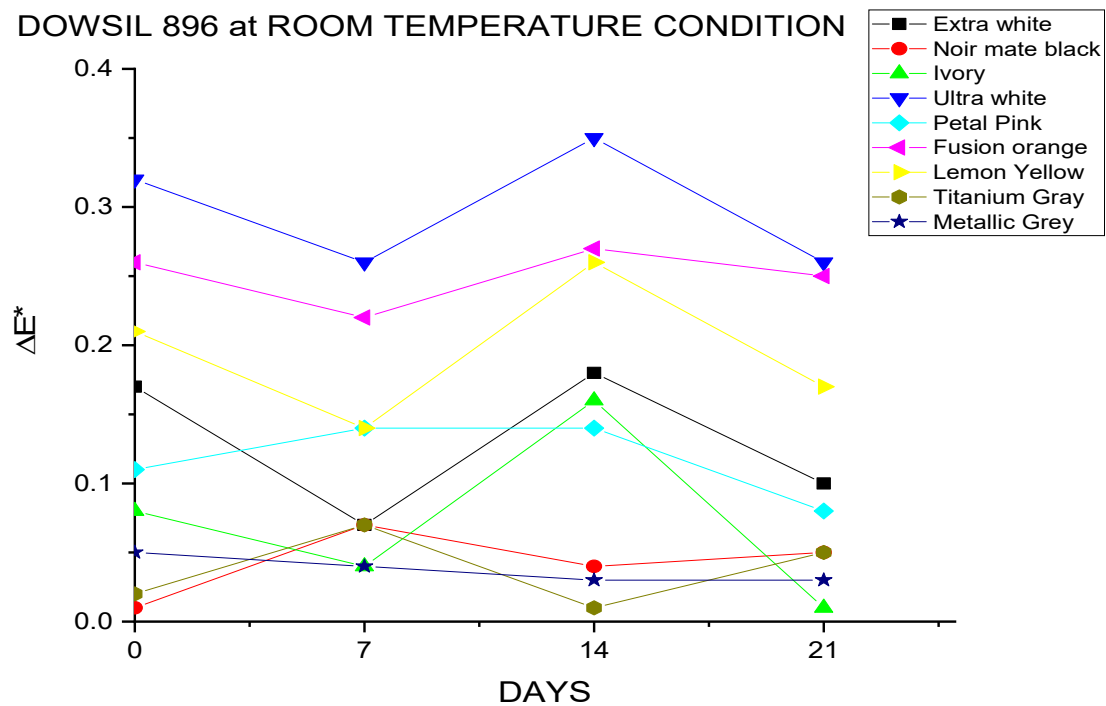
it evident that there are unstable interactions between the sealant and the colour, but the pace of those reactions is far lower than it would be for ageing in a room.

Noir mate Black: According to table 5.22, the colour differences under room conditions are displayed as 0.01, 0.07, 0.04, and 0.05. The ΔE getting response rate for this conditioning appears to be. Following are the colour values in high humidity conditions: 0.02, 0.05, 0.04, and 0.04. Since the responses aren't very high at the 7-day interval, the data was linearly flat and no reactions occurred for this colour shade.

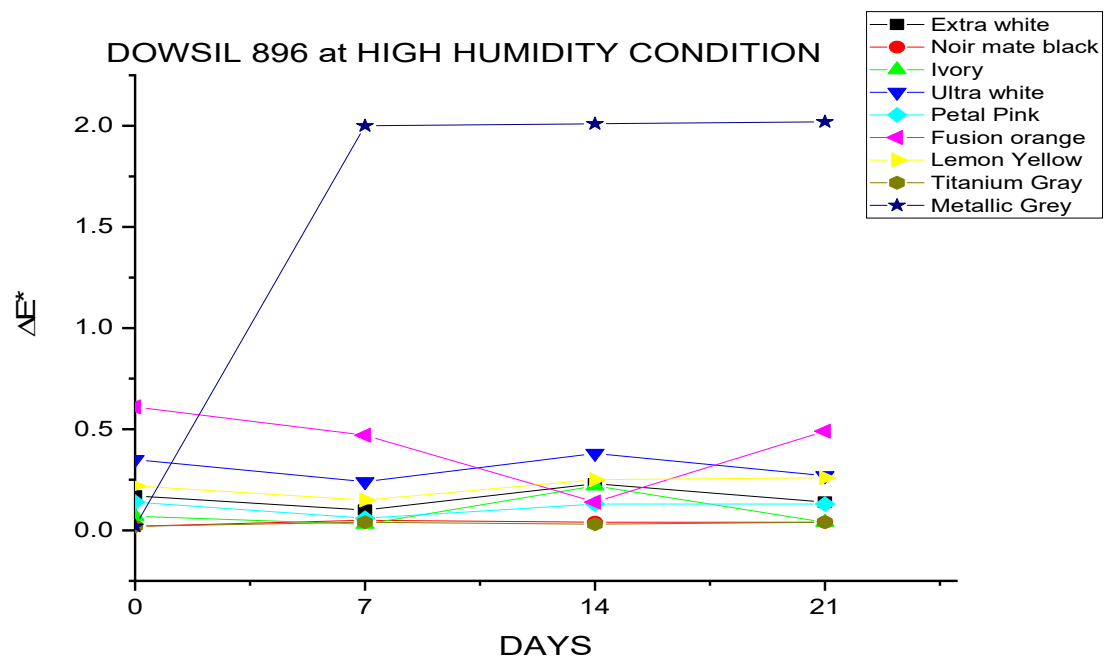
Ivory: According to table 5.22, the colour differences in a room are 0.08, 0.04, 0.16, and 0.01 respectively. It appears that the value derived from the experimental data is. The changes in colour values are displayed under HH as 0.07, 0.03, 0.22, and 0.04. The interval data up to 7 days seems to be fairly similar to the starting value. Suddenly, with dowsil 896 at 14 days as 0.22, responses began to emerge. After that, the colour value started to decrease by 0.04.

Ultrawhite: The colour differences at room temperature are displayed as 0.32, 0.26, 0.35, and 0.26. The data from this colour shade is displayed as having an abrupt spike and fall that repeats itself after 14 and 21 days in this setting. The following values are observed together with the high humidity condition: 0.35, 0.24, 0.38, and 0.27. In this climatic zone, the early phase sees a repeating pattern of the colour difference increasing and decreasing abruptly. Eventually kept at 0.27

5.1.10 GRAPH 03 – Dowsil 896 @ RT



5.1.11 GRAPH 04 – Dowsil 896 @ HH



Petal Pink: The colour differences at normal temperature are displayed as 0.11, 0.14, 0.14, and 0.08. Every time the data is altered, it happens gradually, giving the impression that the reaction pace is quite slow. In addition, the colour values from areas with significant humidity are 0.14, 0.06, 0.13, and 0.13. Initial information suggests that this is the case. The response rate dramatically slows after a 7-day hiatus and is as low as 0.06. Following then, 0.13 was consistently maintained at intervals of 14 and 21 days.

Fusion Orange: The colour differences at room temperature are displayed as 0.26, 0.22, 0.27, and 0.25. The values were obtained from the conditioned region, where dowsil 896 did not cause a reaction at first and the data seemed to be identical to the base data. The values obtained in the high-humidity zone were 0.61, 0.47, 0.14, and 0.49. In this controlled area, colour value first surged dramatically before gradually decreasing over the course of 14 days. finally arrived at 0.49 after 21 days.

Lemon Yellow: The data at the region of room condition are 0.21, 0.14, 0.26, and 0.17. The original values began at 0.21. The response rate then gradually decreases, increases, and so forth. The values obtained in the HH area are as follows: 0.22, 0.15, 0.25, and 0.26. Because the reaction rate unexpectedly decreased from 0.22 to 0.15 owing to this controlled ageing, the response occurred at intervals of 7 days in this controlled humidity zone. After 7 days, the reaction rate becomes more steady.

Titanium Grey: The colour data are displayed as 0.02, 0.07, 0.01, and 0.05 in the room condition area. The response rate is extremely low from the beginning and lasts for up to 21 days. In areas with high humidity, when the reaction rate is too slow, the colour data is shown as 0.02, 0.04, 0.03 and 0.04.

Metallic Grey: The colour data for room condition ageing are displayed as 0.05, 0.04, 0.03 and 0.03. The sealant does not respond from day one, and the pace of response is consistently sluggish. Along with the HH area, values in the following range consistently experience the same response rate: 0.02; 2.00; 2.01; and 2.02. Color value is relatively low at 0 days, only 0.02. In comparison to both dowsil 789 and other hues, the rate of response is particularly high at the 7-day period. Values were calculated as 2. After that, the reaction's stability was continuously maintained.

5.2 COMPATIBILITY STUDIES ON MIRROR

5.2.1 Room temperature Ageing – Dowsil 789

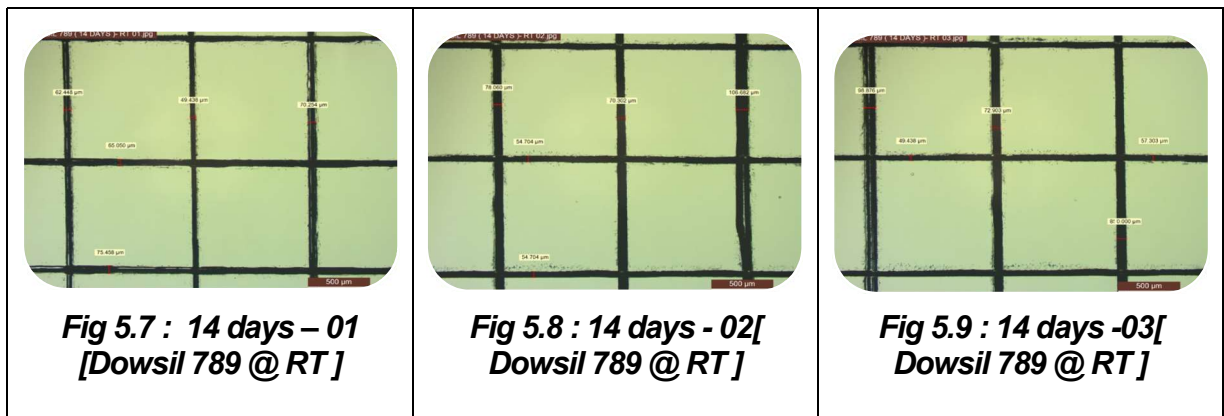
5.2.1.1 Initial pictures of mirror coated by dowsil 789 in RT condition



5.2.1.2 7 days of mirror coated by dowsil 789 in RT condition



5.2.1.3 14 days of mirror coated by dowsil 789 in RT condition



5.2.1.4 21 days of mirror coated by dowsil 789 in RT condition



5.2.1.5 Observation

Over 21 days, there were no developments in faults. When employing dowsil 789 in a room, no responses were noticed. Up to 21 days seem to pass between the initial scratch and the ageing scratch.

5.2.2 High Humidity Ageing – Dowsil 789

5.2.2.1 Initial pictures of mirror coated by dowsil 789 in HH condition



5.2.2.2 days of mirror coated by dowsil 789 in HH condition



5.2.2.3 14 days of mirror coated by dowsil 789 in HH condition



5.2.2.4 21 days of mirror coated by dowsil 789 in HH condition



5.2.2.5 Observation

Over 21 days, there were no developments in faults. Under high humidity circumstances, dowsil 789 did not cause any responses. The original scratch breadth seems to age for up to 21 days.

5.2.3 Room Temperature Ageing – Dowsil 896

5.2.3.1 Initial pictures of mirror coated by dowsil 896 in RT condition



Fig 5.25 : Initial - 01[Dowsil 896 @ RT]



Fig 5.26 : Initial - 02[Dowsil 896 @ RT]



Fig 5.27 : Initial - 03[Dowsil 896 @ RT]

5.2.3.2 days pictures of mirror coated by dowsil 896 in RT condition

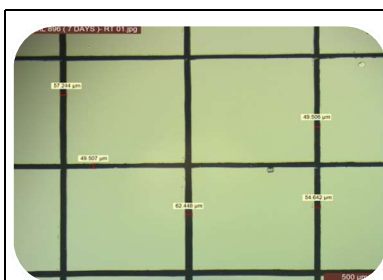


Fig 5.28 : 7 days - 01[Dowsil 896 @ RT]



Fig 5.29 : 7 days - 02[Dowsil 896 @ RT]

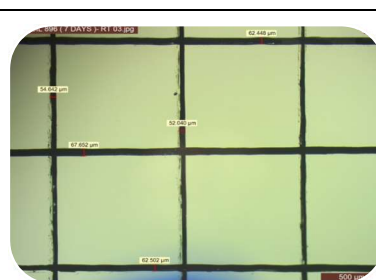


Fig 5.30 : 7 days - 03[Dowsil 896 @ RT]

5.2.3.3 14 days pictures of mirror coated by dowsil 896 in RT condition



5.2.3.4 21 days pictures of mirror coated by dowsil 896 in RT condition



5.2.3.5 Observation

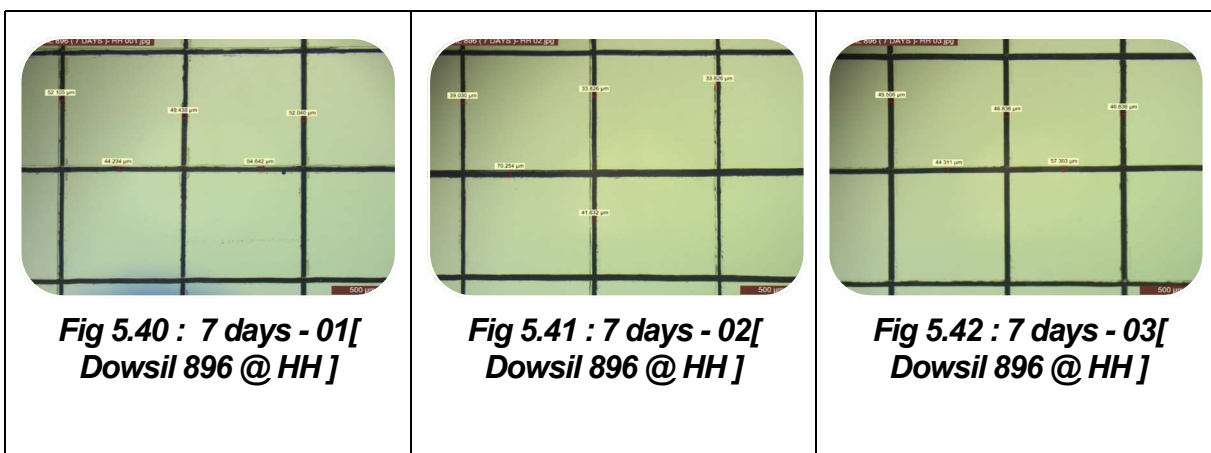
Over 21 days, there were no developments in faults. When utilising dowsil 896 in a room, no responses were noticed. Initial scratch breadth appears to range between 14 and 21 days in age.

5.2.4 High Humidity Ageing – Dowsil 896

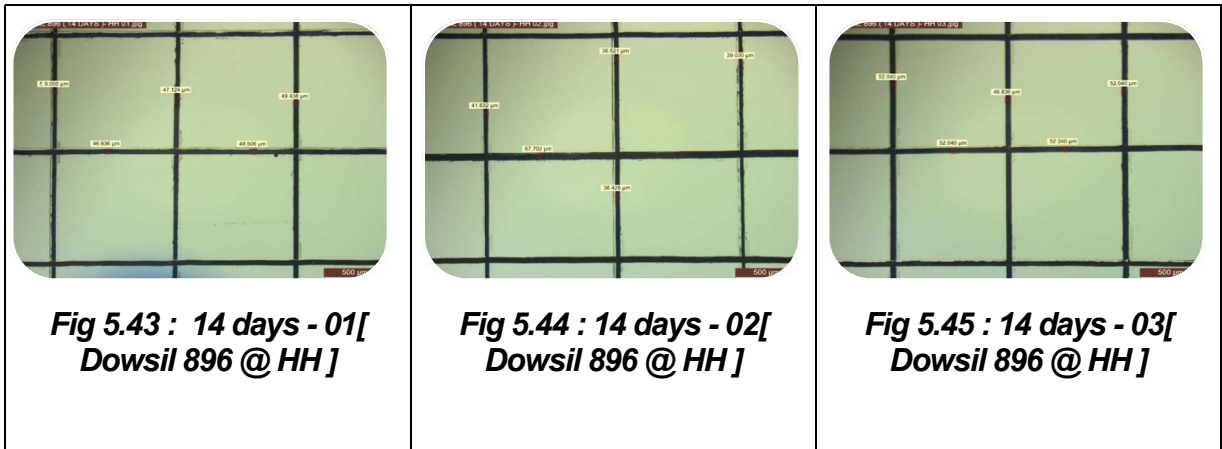
5.2.4.1 Initial pictures of mirror coated by dowsil 896 in HH condition



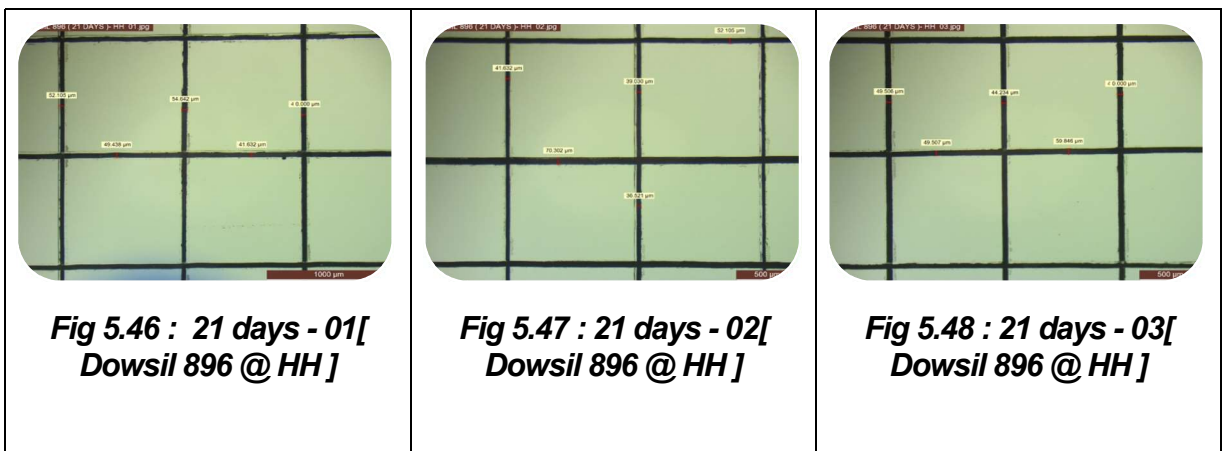
5.2.4.2 7 days pictures of mirror coated by dowsil 896 in HH condition



5.2.4.3 14 days pictures of mirror coated by dowsil 896 in HH condition



5.2.4.4 21 days pictures of mirror coated by dowsil 896 in HH condition



5.2.4.5 Observation:

Over 21 days, there were no developments in faults. When used with high humidity, dowsil 896 showed no responses. The original scratch breadth seems to age for up to 21 days.

5.3 Quick Test [Cuprohydrochloric Salt Solution For Dissolution]– Mirror

5.3.1 Initial and after 1.5hr: dowsil 789 applied @ 2mm

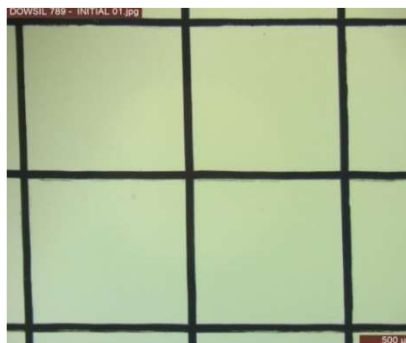


Fig 5.49 - Initial [Dowsil 789 @ 2mm] - Place 01



Fig 5.50 : After 1.5hrs [Dowsil 789 @ 2mm] – Place 01



Fig 5.55 : Intial [Dowsil 789 @ 2mm] - Place 02



Fig 5.56 : After 1.5 hrs [Dowsil 789 @ 2mm] – Place 02

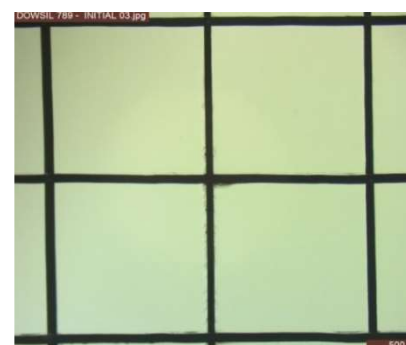


Fig 5.57 : Initial [Dowsil 789 @ 2mm] - place 03

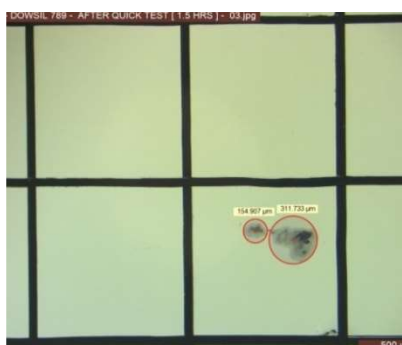


Fig 5.58: After 1.5hrs [Dowsil 789 @ 2mm] – Place 03

5.3.2 Initial and after 1.5hr: dowsil 789 applied @ 4mm



Fig 5.59: Initial [Dowsil 789 @ 4mm] - Place 01

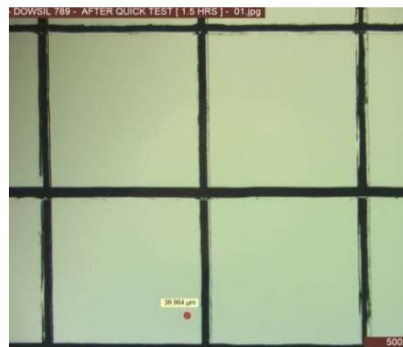


Fig 5.60: After 1.5hrs [Dowsil 789 @ 4mm] – Place 01

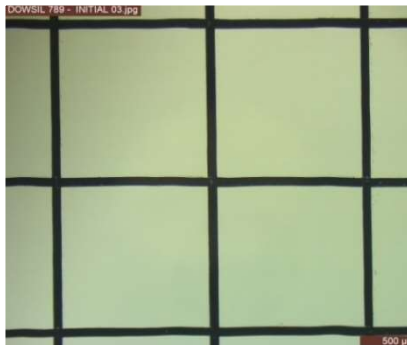


Fig 5.61: Intial [Dowsil 789 @ 4mm] - Place 02

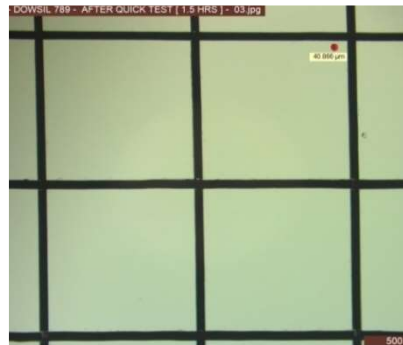


Fig 5.62 : After 1.5 hrs [Dowsil 789 @ 4mm] – Place 02

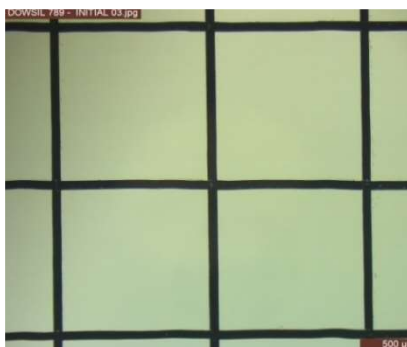


Fig 5.63: Initial [Dowsil 789 @ 4mm]- Place 03



Fig 5.64: After 1.5hrs [Dowsil 789 @ 4mm] – Place 03

5.3.3 Initial and after 1.5hr: dowsil 896 applied @ 2mm

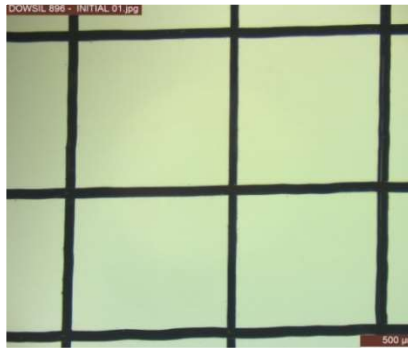


Fig 5.65: Initial [Dowsil 896 @ 2mm] - Place 01



Fig 5.66: After 1.5hrs [Dowsil 896 @ 2mm] – Place 01

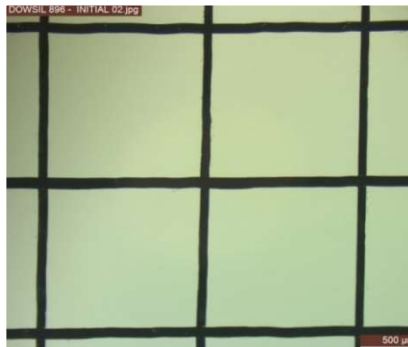


Fig 5.67: Intial [Dowsil 896 @ 2mm] - Place 02

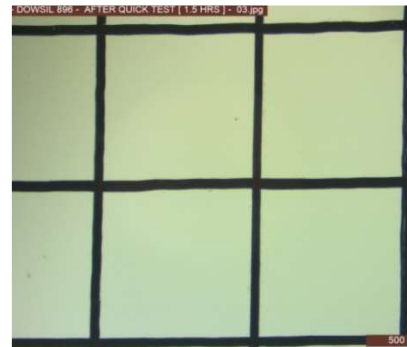


Fig 5.68: After 1.5 hrs [Dowsil 896 @ 2mm] – Place 02



Fig 5.69: Initial [Dowsil 896 @ 2mm] - Place 03

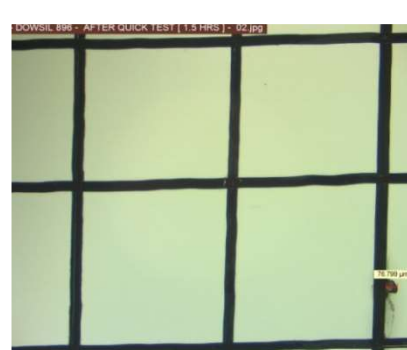


Fig 5.70: After 1.5hrs [Dowsil 896 @ 2mm] – Place 03

5.3.4 Initial and after 1.5hr: dowsil 896 applied @ 4mm

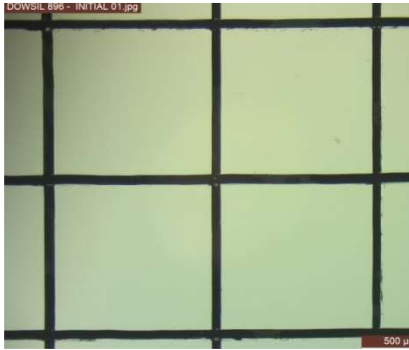


Fig 5.71 : Initial [Dowsil 896 @ 4mm] - Place 01

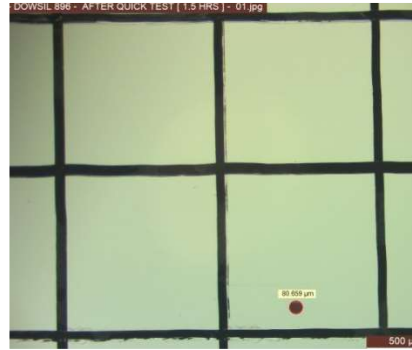


Fig 5.72 : After 1.5hrs [Dowsil 896 @ 4mm] - Place 01

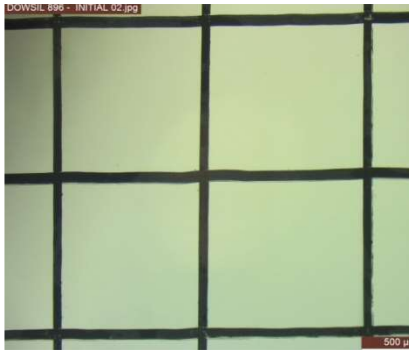


Fig 5.73: Intial [Dowsil 896 @ 4mm] - Place 02

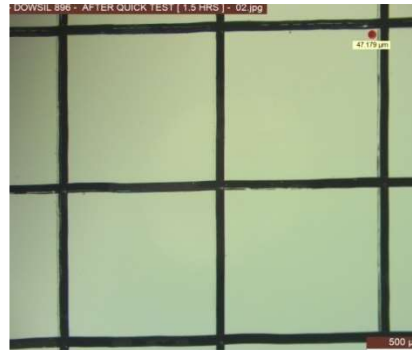


Fig 5.74: After 1.5 hrs [Dowsil 896 @ 4mm] - Place 02

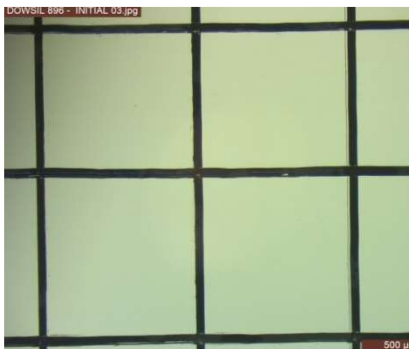


Fig 5.75: Initial [Dowsil 896 @ 4mm] - Place 03

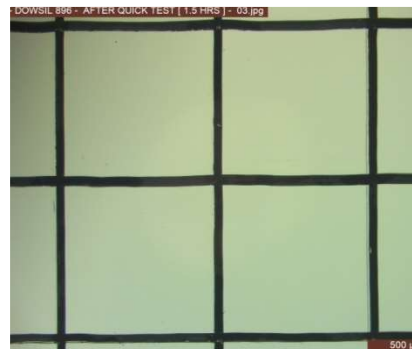


Fig 5.76: After 1.5hrs [Dowsil 896 @ 4mm] - Place 03

Table 5. 23 Final data – Quick Test

S. NO	SEALANTS USED	THICKNESS OVER THE MIRROR	INITIAL CORROSION [MM]	FINAL CORROSION		FINAL COMMENTS
				DUE TO CROSS CUT [MM]	DUE TO NOT A CROSS CUT [MM]	
1	Dowsil 789	2 mm	-	-	31, 155, 312	Partially good
		4 mm	-	-	40, 41	Good
2	Dowsil 896	2 mm	-	36, 41, 77	-	Good
		4 mm	-	-	81, 47	Good

5.3.5 Observation:

- At the first crosscut thickness of 2 mm applied by Dowsil 789, there is no corrosion discernible under the crosscut.
- In addition, the cuprohydrochloric solution used in Dowsil 789's 2mm thickness application in non-corrosive conditions might occasionally lead to increased surface corrosion. One location where corrosion was discovered measured at 312 micron. The continuously maintained sealant layer is being pierced by the acetic solution, which eventually bonds with the silver exposed to cause corrosion despite its thinness.
- Now, the thickness applied was increased to 4 mm, which was continuously crosscut to prevent corrosion, and the thickness of 2 mm was maintained.
- Corrosion forms as 40 and 41 simultaneously with 4mm thickness that is continuously created under no crosscut. According to this investigation, thickening the sealant significantly assisted to prevent corrosion from occurring at the highly concentrated corrosive mixture solution underneath a hot plate.

- Corrosion occurred at the 2 mm thickness that Dowsil 896 applied under crosscut, as clearly shown in Numbers 36, 41, and 77. At the same time, when we measured under the non-crosscut area, corrosion is not happened.
- Corrosion does not occur at the 4 mm thickness applied by dowsil 896 under crosscut. Corrosion occurred simultaneously as 81 and 47 when we measured under non-crosscut region. Based on the results of this investigation, we must maintain a high thickness under crosscut to prevent corrosion under highly concentrated acetic solution.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary

In a real-world client situation, where we met various compatibility issues that may be resolved by doing this experiment, I assessed the possibility of employing lacquered glass fastening. I examined the best ways to choose sealants that will adhere to the substrate we want. I considered the practical relevance and use of the accelerated ageing test. Additionally, how the corrosion manifested itself as the acid-salt solution was being created. Finally, this experiment might be incredibly helpful in understanding how we quantify application testing.

6.2 Conclusions

At a genuine customer's site, I investigated the theory underlying the usage of lacquered glass mounting. There, we ran into a number of compatibility issues that may be resolved by performing this experiment. We considered the most effective methods for choosing sealants that would stick to the substrate we want. I examined the applications of the accelerated ageing test that are depicted in my research. In addition, how the corrosion behaved when the acid and salt solution were being created. Last but not least, knowing how we measure application testing may benefit greatly from this project.

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