

Conformal Coatings

Modern Challenges

Demand New Solutions

A New Generation of Conformal Coatings

AI Technology, Inc

Conformal Coating Webinar



Introduction

Today's Presenters

- Robert Gelosa · Sales Engineer
- Maurice LeBlon · Sales Manager

To learn more please go to:

aitechnology.com/products/conformal-coatings

Visit us on the web: **www.aitechnology.com**

Send us an email: **ait@aitechnology.com**

Give us a call: **1-(609)-799-9388**



Introduction

Topics

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc

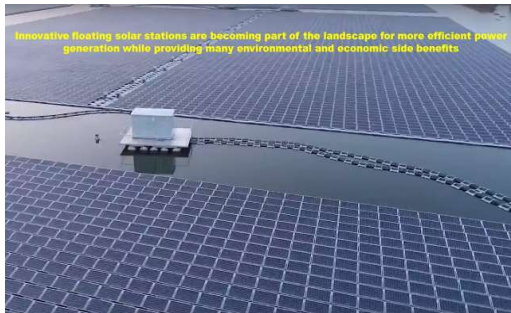


Challenges

Extreme Conditions

Solar

- Constant outdoor exposure to moisture rich environments



Aeronautic electronics

- Rapid and massive temperature fluctuation



Industrial electronics

- Moisture and corrosive gas laden environments



Maritime electronics

- Salt water conditions and high moisture



The Rising Challenges

Difficult Operating Environments

Outdoor operation of commercial electronics And advancements in technology

- Modern cars and electric vehicles
- Autonomous vehicles
- Communication base stations
- Digital displays
- Mobile phones



Challenges

IPC-CC-830C and Beyond

Environmental factors

- Moisture ingress
- Salt-fog ingress
- Fungi attack

Electrical insulation

- High dielectric strength
- High surface resistance
- Low ionic mobility

Beyond traditional protection

- Thickness: thin to ultrathin
- Barrier to corrosive gas permeation
- Salt-spray
- UV stability and protection
- Low interfacial shear stress and stress concentration



Challenges

Testing and Requirements Beyond IPC-CC-830C

Large area circuit boards and induced stress

- Differential thermal expansion
- High profile components

Outdoor operation

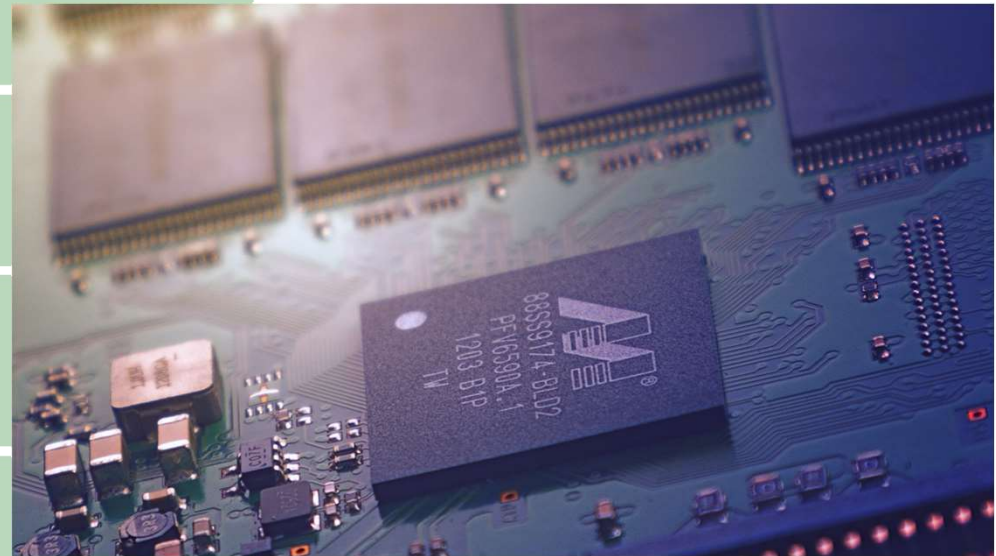
- Industrial gas exposure
- Accelerated degradation

Extreme temperature swings

- Thermal shock
- Temperature cycle testing

Extensive salt-fog and salt-spray

- Aeronautic, industrial, maritime, automotive
- RCTA DO 160



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Conformal Coating Attributes

Current Conformal Coatings and Contemporary Requirements

Seven conformal coating types per IPC-CC-830C

- Acrylic
- Silicone
- Polyurethane
- Paraxylylene
- Epoxy
- Ultra-thin coating
- Styrene block co-polymer

5 Traditional Types
of Conformal
Coating

Modern electronics demand

superior moisture barrier,
corrosive gas barrier,
ionic migration prevention,
stress mitigation,
as well as

cost effectivity and ease in application
for commercial applications

No type of coating meets all demands, YET!

Later in this presentation

AI Technology, Inc. introduces **two new types** of conformal coatings for today's world



Conformal Coating Attributes

Properties Relevant to a Coating Meeting the Requirements

Requirements	Attributes
Modern electronics demand superior moisture barrier, corrosive gas barrier, ionic migration prevention, stress mitigation, as well as cost effectivity and ease in application for commercial applications	Hydrophobicity
	Water Absorption
	Moisture Barrier
	Corrosive Gas Diffusion
	Ionic Migration
	Interfacial Stress and Stress Concentration
	Coating Method



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Hydrophobicity

Background

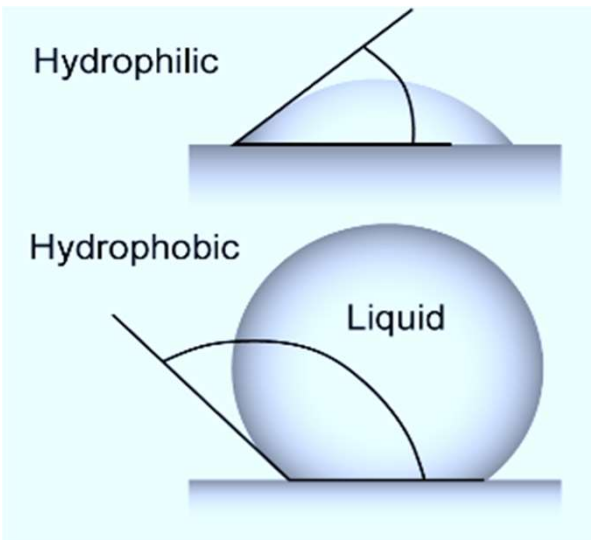
Hydrophobic coating

- Low surface energy
- Non-polar polymer

Water

- High surface energy
- Polar molecules

Incompatibility results in hydrophobic characteristics



Hydrophobicity

Not Enough for Conformal Coating

High moisture barrier is more important

- Low moisture permeable
- Low moisture ingress through polymer free space

Example: Silicone type

- Greatest rate of moisture penetration
- Worst in moisture barrier
- Highly hydrophobic

Why?

- Greatest free space volume



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Water Absorption

Reflection of polymer polarity

- Polar water has affinity to polar polymers

Lowest water absorption does not equate to best protection

- Moisture may still penetrate coating

Coating Application Example

Acrylic: several times more water absorption than silicone

Silicone: orders of magnitude greater water molecule penetration

Acrylic types typically outperforms silicone types in PWB corrosion protection



Water Absorption

Tabulation From Literature

Polymer Name	Min Value (% weight)	Max Value (% weight)
Acrylic-Based Conformal Coatings	0.10	0.40
Polyurethane-Based Conformal Coatings	0.10	0.40
Epoxy-Based Conformal Coatings	0.20	0.60
Silicone-Based Conformal Coatings	0.005	0.05
CC7130-PRTC	0.005	0.01
SC7130-CC	0.03	0.05

New Types
from
AI Technology, Inc



https://imageserv5.team-logic.com/mediaLibrary/99/D116_20Haibing_20Zhang_20et_20al.pdf
<https://omnexus.specialchem.com/polymer-properties/properties/water-absorption-24-hours>

Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Moisture Barrier

Molecular Structure is Key

Greatest problem in current conformal coatings

AIT coatings CC7130-PRTC and SC7130-CC address this issue

Phenomenological terms of polymeric structure

- Free space volume
- Average size of molecular free space: average pore size

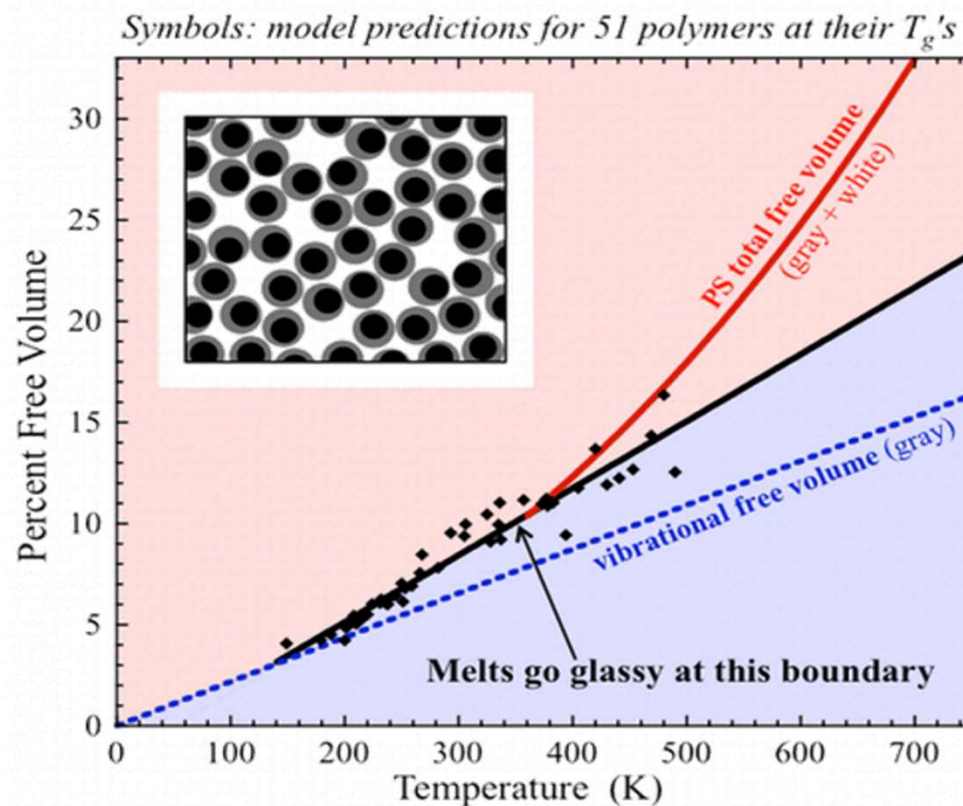
Moisture permeability or transmission rate

- Molecular conformational and packing structure
- Affinity to moisture
- Temperature dependence



Moisture Barrier

Molecular Structure is Key



Polymer Free Volume and Its Connection to the Glass Transition

• [Ronald P. White](#)

• [Jane E. G. Lipson](#)

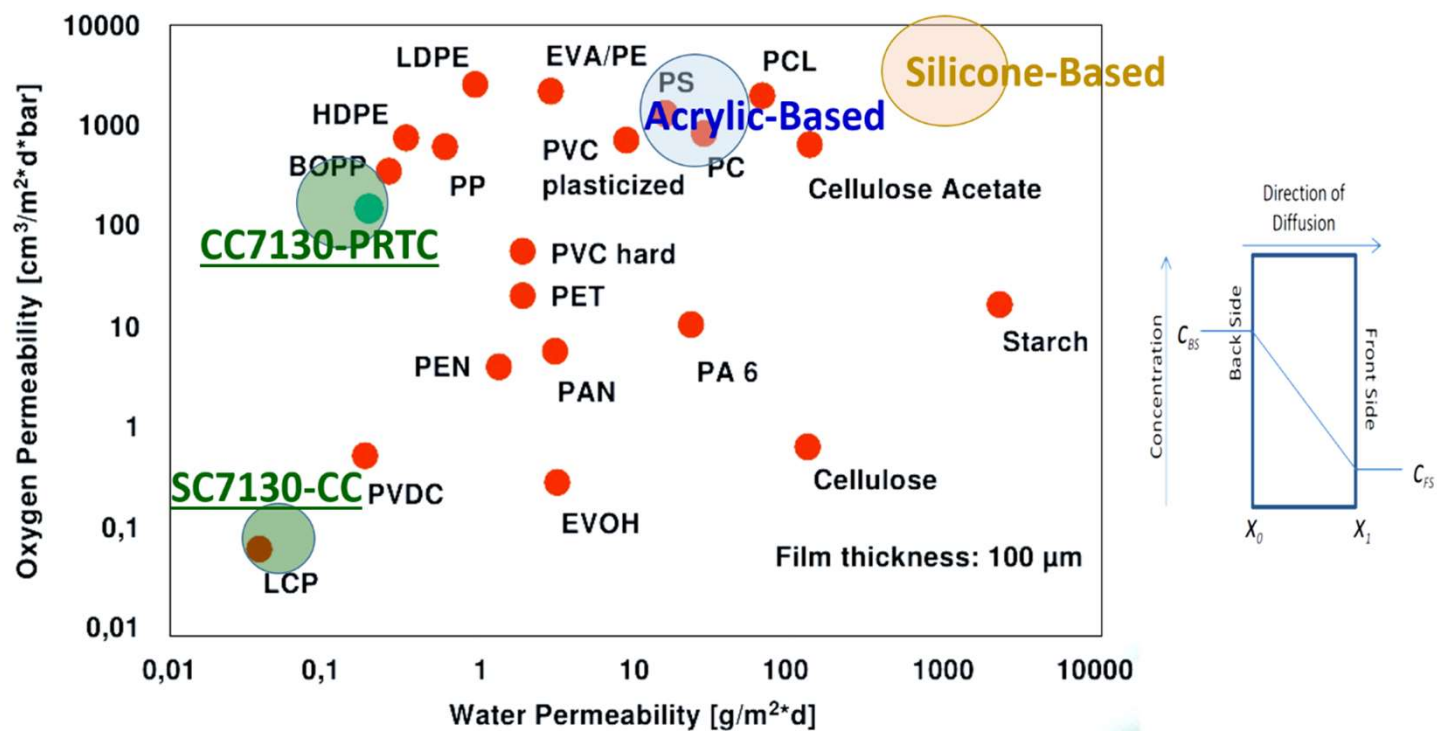
Macromolecules 2016, 49, 11, 3987-4007

Publication Date: May 23, 2016

<https://doi.org/10.1021/acs.macromol.6b00215>



Moisture Barrier



<https://www.slideshare.net/TopasAdvancedPolymers/high-aroma-barrier-films-for-food-packaging>

Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Gas Barrier

Background

Molecular structure

- Free space volume
- Pore size

Gas Diffusion

- Fickian diffusion coefficient
- Thickness
- Temperature

Molecular structure

- Smaller gas molecules – easier, faster penetration

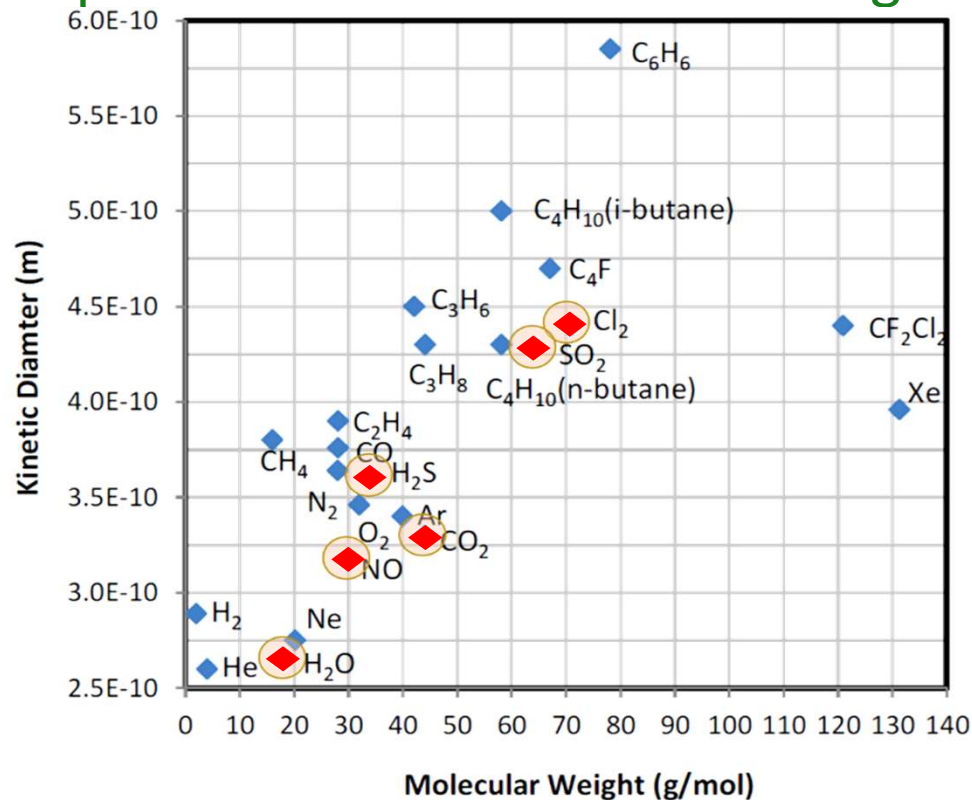
KINETIC DIAMETER (SIZE) OF THE IMPORTANT GAS ELEMENTS THAT NEGATIVELY AFFECT THE LONG-TERM RELIABILITY OF PRINTED CIRCUIT BOARDS AND ELECTRONIC DEVICES

Permeant	Formula	Molecular Weight (g/mol)	Kinetic Diameter (m)	Reference
Helium	He	4.003	2.60×10^{-10}	[Matteucci 2006, p.6]
Water	H ₂ O	18.015	2.65×10^{-10}	[Ismail 2015, p.14]
Neon	Ne	20.180	2.75×10^{-10}	[NPL 2016]
Hydrogen	H ₂	2.016	2.89×10^{-10}	[Ismail 2015, p.14]
Nitric oxide	NO	30.006	3.17×10^{-10}	[McKeen 2012, p.3]
Carbon dioxide	CO ₂	44.010	3.30×10^{-10}	[Ismail 2015, p.14]
Argon	Ar	39.948	3.40×10^{-10}	[McKeen 2012, p.3]
Oxygen	O ₂	31.999	3.46×10^{-10}	[Ismail 2015, p.14]
Hydrogen sulfide	H ₂ S	34.080	3.60×10^{-10}	[Matteucci 2006, p.6]
Nitrogen	N ₂	28.015	3.64×10^{-10}	[Ismail 2015, p.14]
Carbon monoxide	CO	28.053	3.76×10^{-10}	[Matteucci 2006, p.6]
Methane	CH ₄	16.043	3.80×10^{-10}	[Ismail 2015, p.14]
Ethylene	C ₂ H ₄	28.05	3.90×10^{-10}	[Matteucci 2006, p.6]
Xenon	Xe	131.293	3.96×10^{-10}	[McKeen 2012, p.3]
Sulfur Dioxide	SO ₂	64.064	4.29×10^{-10}	[NPL 2016]
Propane	C ₃ H ₈	44.096	4.30×10^{-10}	[Matteucci 2006, p.6]
n-Butane	C ₄ H ₁₀	58.122	4.30×10^{-10}	[McKeen 2012, p.3]
Chlorine	Cl ₂	70.906	4.40×10^{-10}	[NPL 2016]
Difluorodichloromethane	CF ₂ Cl ₂	120.914	4.40×10^{-10}	[McKeen 2012, p.3]
Propylene	C ₃ H ₆	42.080	4.50×10^{-10}	[Matteucci 2006, p.6]
Tetrafluoromethane	C ₄ F	67.041	4.70×10^{-10}	[McKeen 2012, p.3]
i-Butane	C ₄ H ₁₀	58.122	5.00×10^{-10}	[McKeen 2012, p.3]
Benzene	C ₆ H ₆	78.112	5.85×10^{-10}	[Li 1993, p.373]



Gas Barrier

Importance to Conformal Coating



Damaging effects

- Copper
- Tin metallization

Especially relevant gases

- Moisture
- Nitrogen oxide
- Carbon dioxide
- Hydrogen sulfide
- Sulfur dioxide
- Chlorine

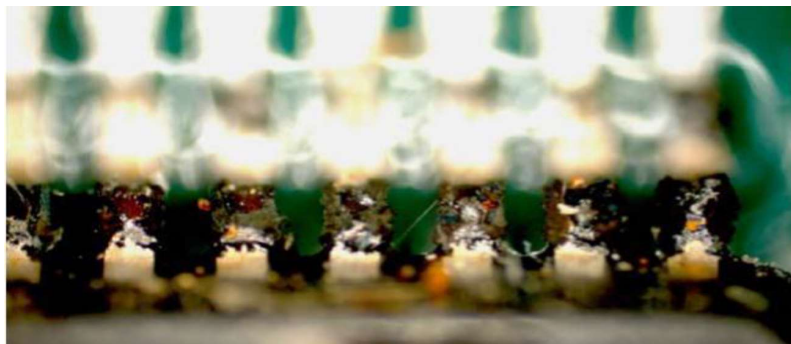
https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-26070.pdf

AI Technology, Inc – Conformal Coating Webinar



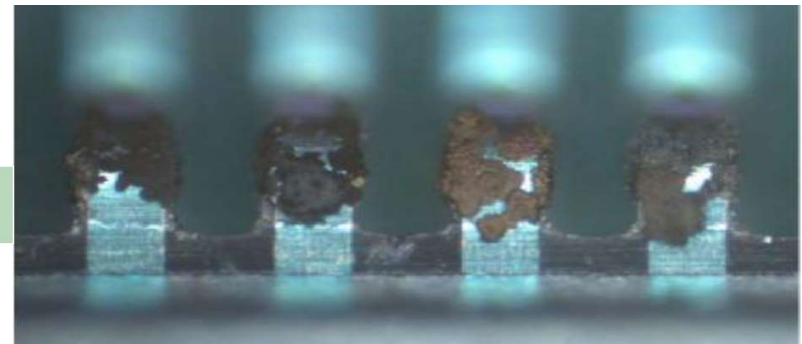
Gas Barrier

Examples of Harmful Gas Damage



Silicone Type

Ultra-Thin Al₂O₃ Coating



Effectiveness of Conformal Coat to Prevent Corrosion of Nickel-palladium-gold-finished Terminals by Michael Osterman,
http://www.circuitinsight.com/pdf/effectiveness_conformal_coat_prevent_corrosion_nickel_palladium_gold_ipc.pdf



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc

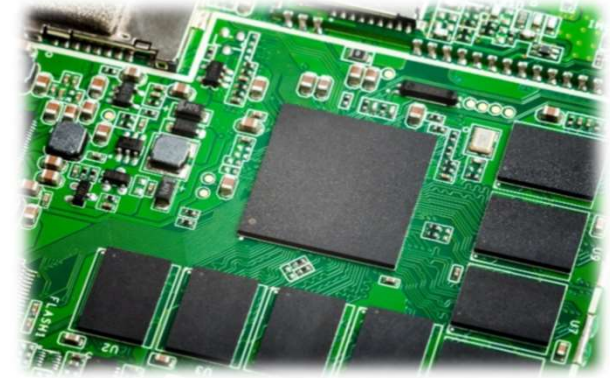


Ionic Migration

Background and Importance

Ionic Contaminants

- Salt-spray and salt-fog environments
- Improper cleaning before coating



Electric fields drive ionic migration

- Leads and components generate E-Field

Degradation to circuit impedance

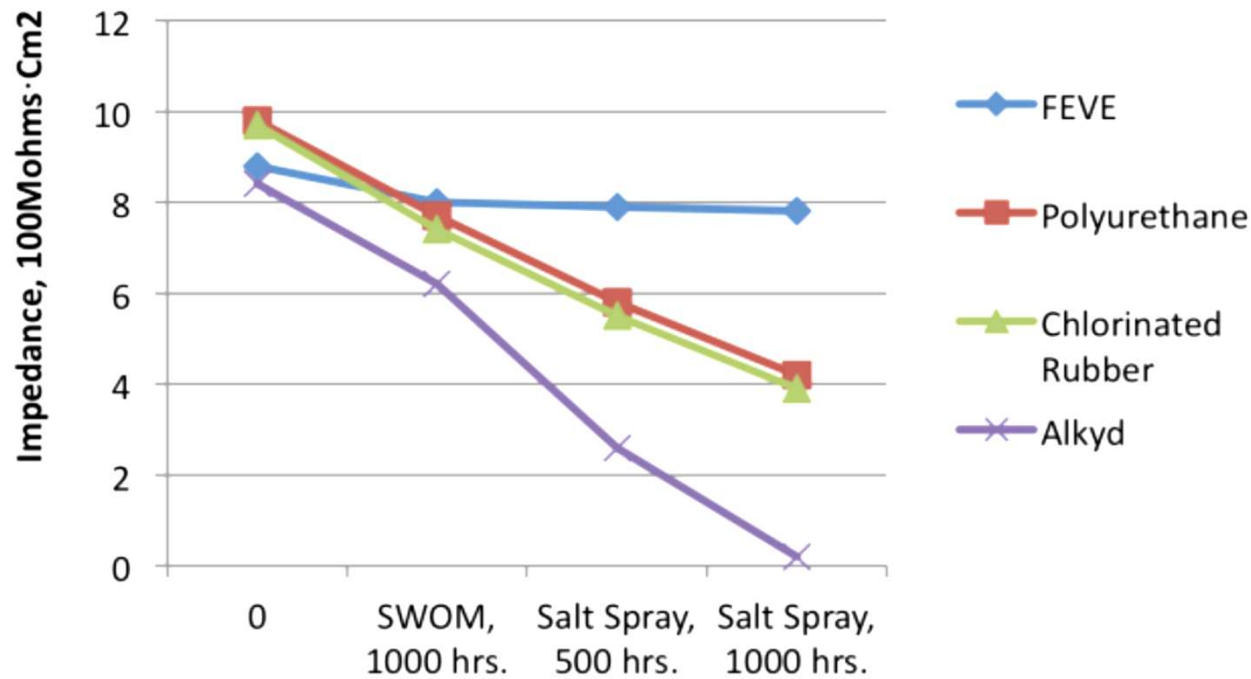
Growing challenge

- High frequency devices
- Extreme proximity of components
- Rise of 5G with fine-pitch components



Ionic Migration

Impedance Degradation



<https://www.aisc.org/globalassets/nsba/conference-proceedings/2018/2018-wsbs-final-paper---darden.pdf>

Ionic Migration

Salt-spray testing not used by IPC-CC-830C

**Stringent testing
relevant to**

**Aeronautic
Marine
Industrial
Automotive**

SC7130-CC: unparalleled advantage over acrylic based on RTCA DO 160



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Interfacial Stress and Stress Concentration

Causes

Differential CTE induces stress on conformal coating and stress concentration at sharp interfaces

PCB

- Planar CTE 16-20 ppm/°C
- Z-axis CTE > 70 ppm/°C

Conformal Coatings

- Acrylic and epoxy types: CTE 55 – 65 ppm/°C
- Parylene type: CTE ~ 35 ppm/°C

Operating temperatures different from curing temperatures induce stress

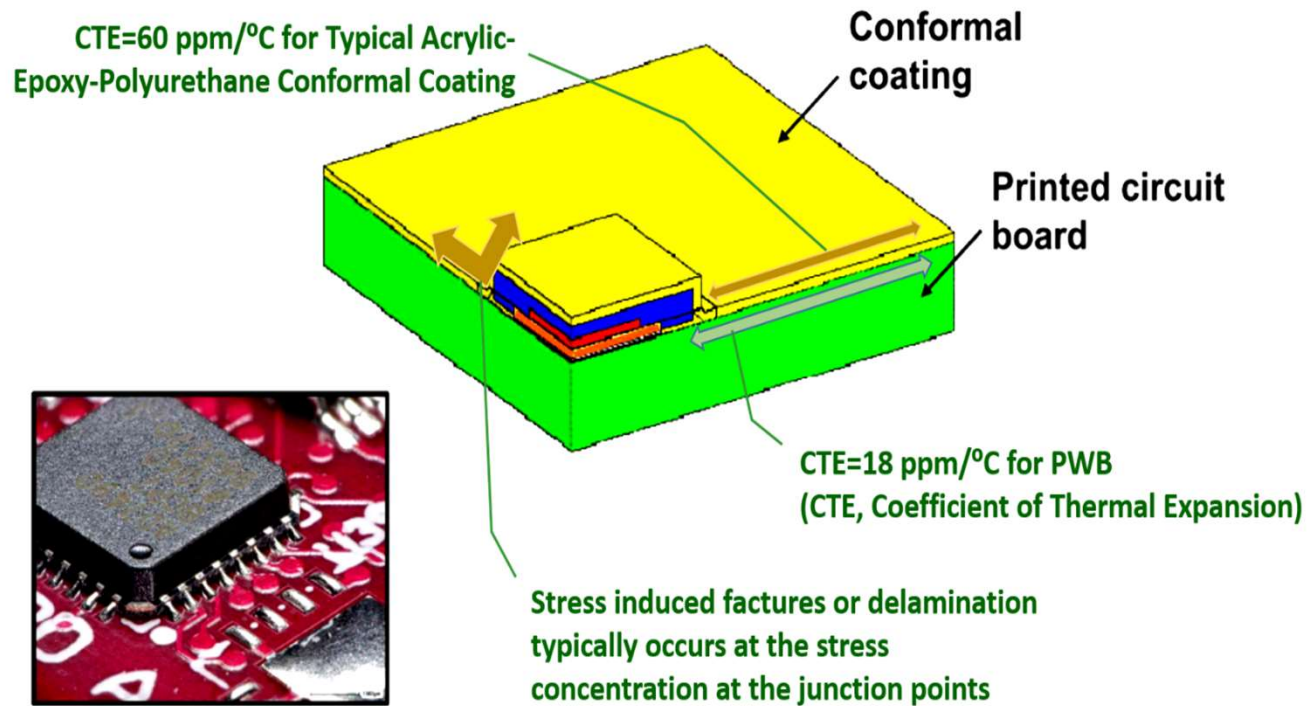
- Compressive stress: excursions below cure temperature
- Tensile stress: excursions above cure temperature

Higher modulus of conformal coating increases tensile and compressive stress



Interfacial Stress and Stress Concentration

Pictorial Representation



Computational Models: A Critical Enabler of Advanced Electronic Packaging for Use in High-Reliability Applications, Paul T. Vianco <https://www.osti.gov/servlets/purl/1507040>



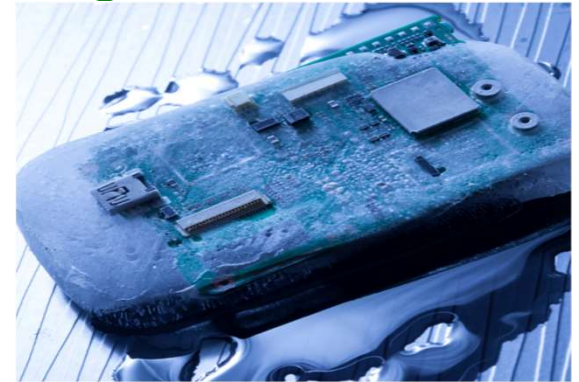
Interfacial Stress and Stress Concentration

Solution: Flexible, Stress-Free Conformal Coating

Without ability to match CTE, coating must have

Low modulus

Capability to stretch



CC7130-PRTC and SC7130-CC
molecularly engineered with
low modulus and high flexibility
to not induce shear, compressive stresses, and stress concentration.



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



Coating Method

Vacuum Deposition Limits Possibilities

Parylene conformal coating

- High performance
- Vacuum deposition
 - Cost
 - Batch Size

Acrylic conformal coating

- Predominate
- Lesser performance
- Cost
- Ease of application

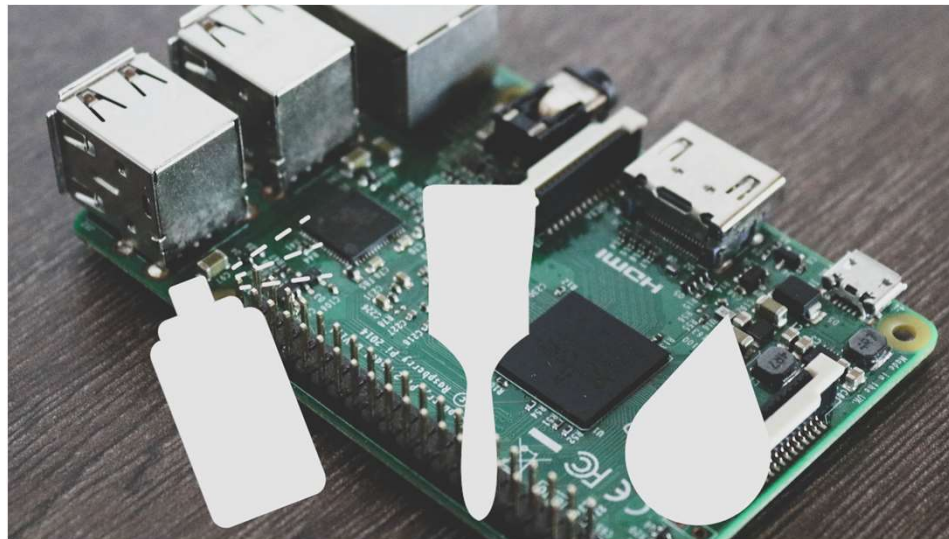


Coating Method

Ease of Application

Ideal Conformal Coating

- Industrial standard spray-brush-dip coating method
- Performance equivalent to Parylene



Topic

Rising Challenges for Conformal Coating

Conformal Coating Attributes

Hydrophobicity

Water Absorption

Moisture Barrier

Gas Diffusion

Ionic Migration

Interfacial Stress and Stress Concentration

Coating Method

New Types of Conformal Coatings by AI Technology, Inc



New Types of Conformal Coatings by AIT

CC7130-PRTC & SC7130-CC

Molecularly Engineered Polymer Structure

- CC7130-PRTC: Modified Ethylene
- SC7130-CC: Fluorinated Polymer

Hydrophobic

Superior Moisture Barrier

Harmful Gas Barrier

Ionic Migration Prevention

Flexible & Stress-Free

Spray-Dip-Brush Coating Method



New Types of Conformal Coatings by AIT

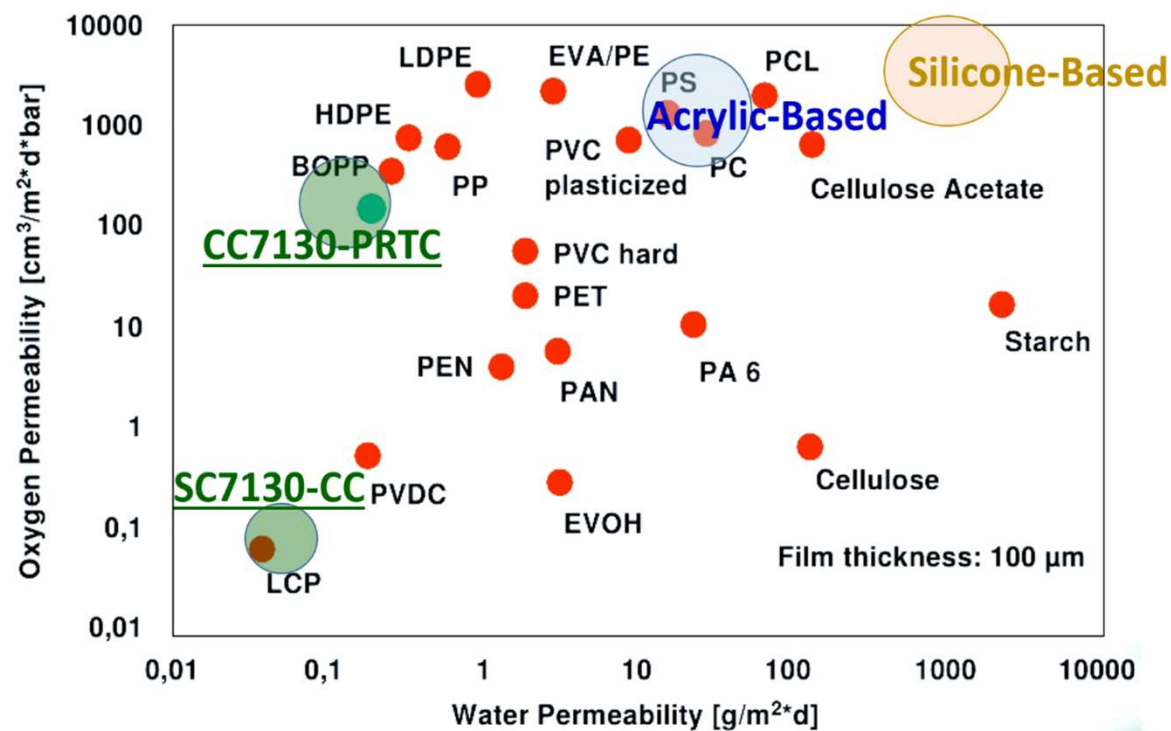
Polymer Name	Min Value (% weight)	Max Value (% weight)
Acrylic-Based Conformal Coatings	0.10	0.40
Polyurethane-Based Conformal Coatings	0.10	0.40
Epoxy-Based Conformal Coatings	0.20	0.60
Silicone-Based Conformal Coatings	0.005	0.05
CC7130-PRTC	0.005	0.01
SC7130-CC	0.03	0.05

New Types
from
AI Technology, Inc



https://imageserv5.team-logic.com/mediaLibrary/99/D116_20Haibing_20Zhang_20et_20al.pdf
<https://omnexus.specialchem.com/polymer-properties/properties/water-absorption-24-hours>

New Types of Conformal Coatings by AIT

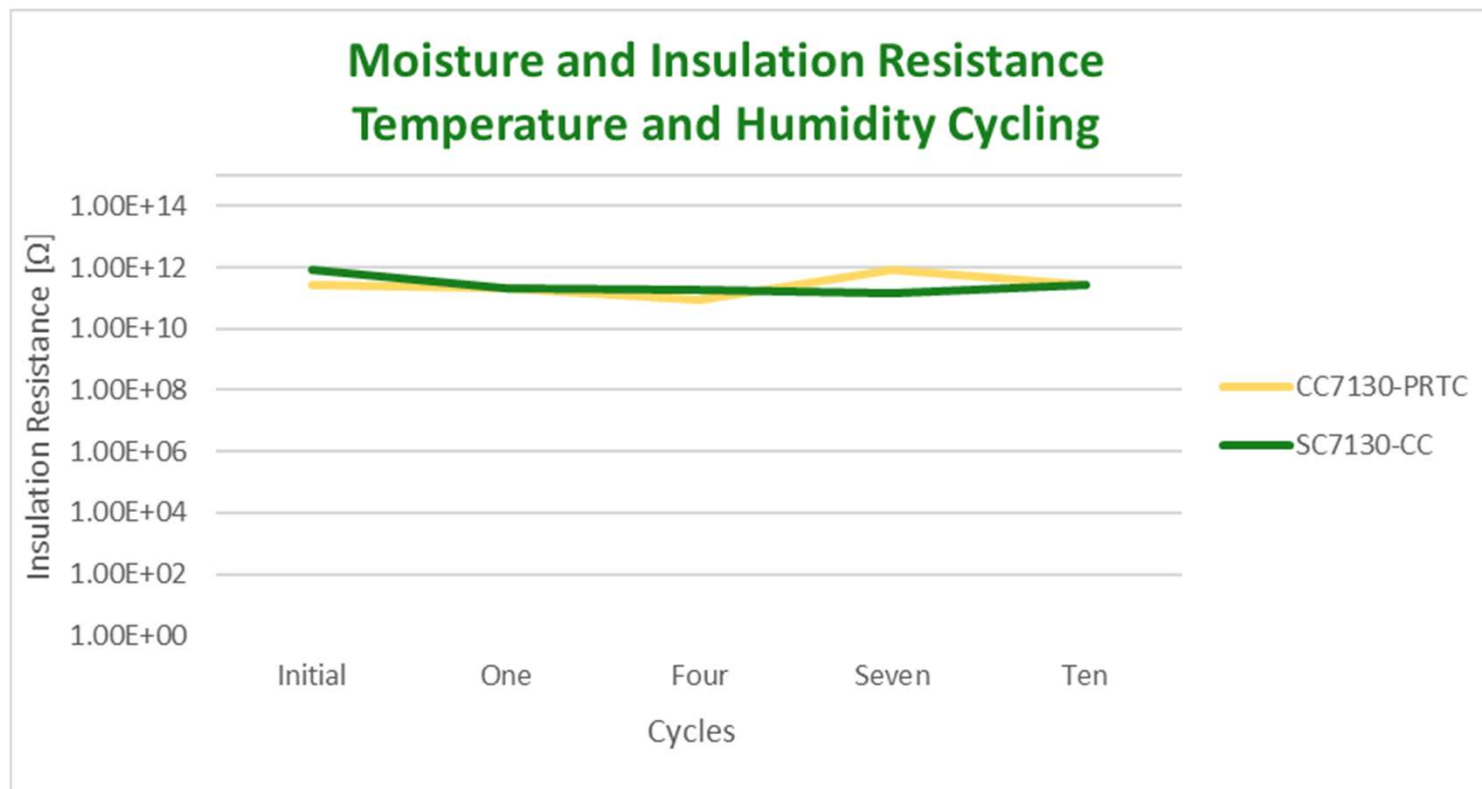


<https://www.slideshare.net/TopasAdvancedPolymers/high-aroma-barrier-films-for-food-packaging>



New Types of Conformal Coatings by AIT

Strong Adhesion

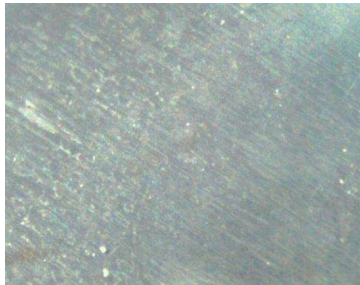


New Types of Conformal Coatings by AIT

SC7130-CC Flower of Sulfur Testing

Silver foil under microscope

Uncoated
Before
FoS Test



Coated with
SC7130-CC
AFTER 10
day
FoS Test



Same Bright Sheen

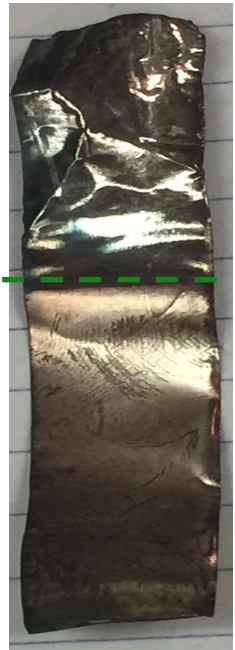
Humid Sulfur Test at 60C for 10 Days

Uncoated



Coated with
SC7130-CC

Uncoated



Coated with
Other
Conformal
Coating
Types



Customer Feedback on AIT Conformal Coating

AI Technology customers have found that AIT coatings are the only ones that worked for their high performance application.

The following are excerpts from customer feedback:



- “...the **penetration of water vapor** into the printed circuit assembly from **high humidity conditions** is **blocked sufficiently** to avoid the destabilization experienced with **those other conformal coating products** previously used....”
- “...We had **good success** when brushing or dipping with the coating as supplied in the sample you provided....”
- “...It is our conformal coating of choice. It probably **should be the choice** for **many electronic assemblies** that may be adversely affected by moisture absorption.”
- “...We intend to use [AIT coatings] in **ongoing production**...”
- “... **strong non-hygroscopic properties** even with long exposure to humidity of 90% RH (Relative Humidity) and greater....”
- “... **other conformal coatings** indicated that they possessed great hydrophobic properties... those resisting the moisture absorption are much less common. We did much testing, using our own printed circuit assemblies as our primary instrument... properties [of AIT coating] **proved to be outstanding**.



New Types of Conformal Coatings by AIT

SC7130-CC IPC-CC-830C Independent Lab Test Results

SC7130-CC Per IPC-CC-830C Independent Lab Certification Results			
Test	Procedure-Method	Requirements/Comments	Results
Coating Thickness (Spray and Dip Coating Method)	Thickness measurement	Thickness: Min. 12.5µm; Max. 50µm in meeting all requirements for "Parylene Classification" of performance. All other classes need heavier coating.	PASS
Visual inspection	On glass plate under white and UV light	Coating must have uniform appearance and consistency	PASS
Fluorescence	On glass plate under black (UV) light	Coating must fluoresce under UV black light (typical wavelength 365nm)	PASS
Fungus resistance	IPC-TM-650 section 2.6.1.1 on glass plate	Not attacked by biological growth	PASS
UL 94 test strip for flammability	UL 94 HB	Must meet a minimum horizontal burning test	PASS; V-0 Self-Extinguishing
Flexibility	IPC-TM-650 section 2.4.5.1 on tin panel	No evidence of cracking or crazing of the cured coating	PASS
Dielectric Withstanding Voltage	IPC-TM-650 sec. 2.5.7.1 on IPC-B-25A Test Board	No disruptive discharge, sparkover, or breakdown. @1500VAC, Max 10 uA leakage rate; Pattern D insulation resistance >10 ¹² Ω	PASS
Moisture and Insulation Resistance	IPC-TM-650 section 2.6.3.4 on IPC-B-25A	Minimum 500MΩ for ER and 5GΩ for all other types after exposure to humidity within 1-2hours of exposure; Insulation resistance post moisture exposure: >10 ¹¹ Ω = before exposure (No Degradation)	PASS, Meets Requirements for "Parylene Type"
Thermal Shock	IPC-TM-650 section 2.6.7.1 on IPC-B-25A	Appearance and Dielectric Withstand Voltage after testing must meet the above-mentioned passing levels	PASS
Temperature and Humidity Aging	IPC-TM-650 sect. 2.6.11.1 on "Y Panel" test coupon	No evidence of softening, tack, cracking, loss of adhesion, or reversion	PASS
New Type of Conformal Coating from AI Technology, Inc.	<ul style="list-style-type: none"> > SC7130-CC is a new class of thin conformal coating with molecular structure of fluorinated polymer for hydrophobic and moisture barrier > Designed for low cost spray-dip-brush coating methods to achieve 12.5-50µm thickness > The strong and tight molecular stability is engineered for extreme conditions including salt-fog, salt-water, acid rain, and corrosive environments > This Parylene replacement conformal coating has been proven to outperform all traditional conformal coating in more stringent Radio Technical Commission for Aeronautics (RTCA DO 160) applications 		



New Types of Conformal Coatings by AIT

CC7130-PRTC

IPC-CC-830C

Independent Lab Test Results

CC7130-PRTC Per IPC-CC-830C Independent Lab Certification Results			
Test	Procedure-Method	Requirements/Comments	Results
Coating Thickness (Spray and Dip Coating Method)	Thickness measurement	Thickness: Min. 12.5µm; Max. 50µm in meeting all requirements for "Parylene Classification" of performance. All other classes need heavier coating.	PASS
Visual inspection	On glass plate under white and UV light	Coating must have uniform appearance and consistency	PASS
Fluorescence	On glass plate under black (UV) light	Coating must fluoresce under UV black light (typical wavelength 365nm)	PASS
Fungus resistance	IPC-TM-650 section 2.6.1.1 on glass plate	Not attacked by biological growth	PASS
UL 94 test strip for flammability	UL 94 HB	Must meet a minimum horizontal burning test	PASS
Flexibility	IPC-TM-650 section 2.4.5.1 on tin panel	No evidence of cracking or crazing of the cured coating	PASS
Dielectric Withstanding Voltage	IPC-TM-650 sec. 2.5.7.1 on IPC-B-25A Test Board	No disruptive discharge, sparkover, or breakdown. 1500VAC, Max 10 uA leakage rate; Pattern D insulation resistance >10 ¹² Ω	PASS
Moisture and Insulation Resistance	IPC-TM-650 section 2.6.3.4 on IPC-B-25A	Minimum 500MΩ for ER and 5GΩ for all other types after exposure to humidity within 1-2hours of exposure; Insulation resistance post moisture exposure: >10 ¹¹ Ω = before exposure (No Degradation)	PASS, Meets Requirements for "Parylene Type"
Thermal Shock	IPC-TM-650 sec. 2.6.7.1 on IPC-B-25A	Appearance and Dielectric Withstand Voltage after testing must meet the above-mentioned passing levels	PASS
Temperature and Humidity Aging	IPC-TM-650 sec. 2.6.11.1 on "Y Panel" test coupon	No evidence of softening, tack, cracking, loss of adhesion, or reversion	PASS
New Type of Conformal Coating from AI Technology, Inc.	<ul style="list-style-type: none"> ➤ CC7130-PRTC is a new class of thin conformal coating with molecular structure of high density and crystallinity polymer for hydrophobicity and moisture barrier ➤ Designed for low cost spray-dip-brush coating methods to achieve 25-50µm thickness ➤ This Parylene replacement conformal coating is molecularly engineered for extreme conditions including salt-fog, salt-water, and moisture laden environments 		



New Types of Conformal Coatings by AIT

Physical and Electrical Properties of SC7130-CC and CC7130-PRTC

PHYSICAL CHARACTERISTICS OF SC7130-CC		
ELECTRICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Dielectric Strength	0.8	KV/mil
Dielectric Constant (1 MHz)	3.9	
Dielectric Loss (1 MHz)	0.03	
Volume Resistivity	1.8x10 ¹⁴	ohm-cm
SAFETY OF FLAMMABILITY	STANDARD AND CONDITIONS (@25°C)	RATING
Flammability	UL 94	HB and V-0
THERMAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Glass Transition Temperature (Tg)	-45	°C
"Melting Point"	>120	°C
Coefficient of Thermal Expansion	95	ppm/°C
Thermal Conductivity	1	BTU-IN/hr-ft ² -°F
Thermal Decomposition	>350 (1% Weight Loss in Air)	°C
MECHANICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Hardness	50	Shore D
Tensile Modulus	40,000/(275)	psi/(Mpa)
Flexural Modulus	30,000/(206)	psi/(Mpa)
Tensile Elongation	300	%
OPTICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Refractive Index (D542)	1.43	
WATER-MOISTURE PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Water Absorption (D570)	<0.01	%
	<i>Typical Acrylic (>0.4)</i>	%
Water Permeability	0.0009	(gm.mm/m ² .d) @ 1atm
	<i>Typical Acrylic (>5.2)</i>	(gm.mm/m ² .d) @ 1atm

PHYSICAL CHARACTERISTICS OF CC7130-PRTC		
ELECTRICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Dielectric Strength	0.7	KV/mil
Dielectric Constant (1 MHz)	2.9	
Dielectric Loss (1 MHz)	0.01	
Volume Resistivity	1.2x10 ¹⁴	ohm-cm
SAFETY OF FLAMMABILITY	STANDARD AND CONDITIONS (@25°C)	RATING
Flammability	UL 94	HB and V-0
THERMAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Glass Transition Temperature (Tg)	-55	°C
"Melting Point"	>110	°C
Coefficient of Thermal Expansion	105	ppm/°C
Thermal Conductivity	0.6	BTU-IN/hr-ft ² -°F
Thermal Decomposition	>330 (1% Weight Loss in Air)	°C
MECHANICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Hardness	65	Shore A
Tensile Modulus	20000/(138)	psi/(Mpa)
Flexural Modulus	15,000/(103)	psi/(Mpa)
Tensile Elongation	250	%
OPTICAL PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Refractive Index (D542)	1.5	
WATER-MOISTURE PROPERTIES	STANDARD AND CONDITIONS (@25°C)	UNITS
Water Absorption (D570)	<0.03	%
	<i>Typical Acrylic (>0.4)</i>	%
Water Permeability	<0.05	(gm.mm/m ² .d) @ 1atm
	<i>Typical Acrylic (>5.2)</i>	(gm.mm/m ² .d) @ 1atm



Thank you! Any Questions?

To learn more please go to:
aitechnology.com/products/conformal-coatings

Visit us on the web: **www.aitechnology.com**
Send us an email: **ait@aitechnology.com**
Give us a call: **1-(609)-799-9388**



AI Technology, Inc
Conformal Coating Webinar

