



**SCS**

# PARYLENES

Ideal waterproofing solutions  
for consumer electronic devices



*SPECIALTY COATING SYSTEMS™*

*A KISCO Company*

# SCS PARYLENES: Ideal waterproofing solutions for consumer electronic devices

High-tech coatings trusted to protect aerospace and defense components are also protecting consumer electronics

Consumers have integrated advanced electronics into their lives. They carry their smartphones everywhere while wearing headphones, watches and other devices as they go about their day-to-day routines. However, the risk of moisture damage from rain, perspiration and humidity is an ever-present concern.

Buyers of consumer electronics no longer seem satisfied with “splash-proof” or “water-resistant” but, rather, want the peace of mind that their gear is truly waterproof.



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## THE SOLUTION: SCS PARYLENES

Parylenes are the name for a unique series of polymers first developed by scientists at Union Carbide, the company that eventually founded Specialty Coating Systems. Over the last 45 years, SCS has worked with major customers in the electronics, aerospace, defense, transportation and medical device industries, designing custom solutions to protect electronics and other delicate equipment from exposure to water, chemicals, dust and other hazards.

The range of applications includes:

- Electronics used to power and monitor a variety of systems
- LEDs that illuminate cities, markets and stadiums
- Medical devices implanted in the human body
- Aerospace and defense aircraft operating under extreme conditions
- Automotive sensors that monitor and control engine systems

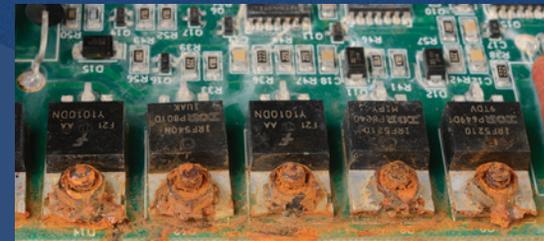
## HOW PARYLENE COATINGS WORK

The raw material used in the Parylene coating process begins as a solid material that is vaporized under vacuum. The resulting vapor then enters a room temperature chamber and completely envelopes the surface to be protected, one molecule at a time, forming an ultra-thin coating that conforms evenly and flawlessly to every surface, crack and crevice – no matter how tiny or complex the device may be.

In comparison, liquid-based materials can adhere unevenly; coatings may be too thin in some places and, in others, may pool due to the effects of gravity during curing or drying processes. Liquid applications may also leave gaps where no coating is applied. Parylene evenly adheres to surfaces and can be applied in extremely thin layers – measured in angstroms to thousandths of an inch – to avoid adding bulk to ever-shrinking electronic components.



Coated with SCS ParyFree®



Uncoated

Circuit boards coated with ParyFree® were salt-fog tested by an independent facility. The coated boards exhibited no corrosion, salt or heavy iron oxide deposits after 144 hours of exposure in accordance with ASTM B117-(03). Boards coated with SCS Parylene C and Parylene HT® exhibited similar results.



## DEFINING “WATERPROOF”

Consumers know what they mean by waterproof and it usually means more than just protection from rain or a spilled drink. For the owner of a treasured device, the true test of “waterproof” is whether the device can survive an unexpected fall into water.

For consumer electronics, the industry defines waterproofing in terms of ‘ingress protection’. Independent laboratories conduct a series of internationally-recognized tests and issue IPX ratings that are specific to water tests.

For example, a device with an IPX1 rating can survive only a few drops of water while an IPX4 rating means the device can survive being splashed. SCS Parylene-coated electronics have passed IPX8 testing. The coated electronics were functional after full immersion in 1.5 meters of water for 30 minutes, whereas the uncoated electronics immediately failed.

An aerial photograph of a dense evergreen forest, likely spruce or fir, with a dark, semi-transparent rectangular overlay in the center containing white text. The trees are vibrant green and densely packed, creating a textured background.

## **PARYFREE®**

### **A NEW HALOGEN-FREE PARYLENE OPTION**

Because consumers quickly upgrade to newer models, proper disposal of obsolete devices is a challenging issue for the consumer electronics industry. Many device manufacturers have committed to reduce or eliminate use of fluorine, chlorine and other halogen materials that can emit toxic pollutants when discarded devices are recycled or incinerated.

As international standards and initiatives continue to evolve, SCS is at the forefront of compliance and innovation of environment-friendly production techniques. Although Parylene variants that contain chlorine molecules are extremely stable, even at high temperatures, SCS has developed a new variant – ParyFree® – that is entirely halogen-free and boasts the beneficial attributes of other commercially-available Parylene variants. ParyFree offers consumer electronic manufacturers improved moisture barrier properties over traditional non-halogen Parylene variants.

## **BENEFICIAL DIELECTRIC PROPERTIES**

Parylene coatings have extremely high dielectric strengths, also known as voltage breakdown, so coated surfaces do not conduct electricity. Their insulation properties stem from not only the chemistry of Parylene, but also from the deposition process in which the protective coatings form in thin, continuous films that are free from the defects and fillers commonly found in conventional coatings. For contact points that need to remain active, SCS' applications engineering team develops processes to prevent coating sensitive areas or to remove the film in post-coat processes.





## **PARTNERING WITH CUSTOMERS**

To maintain the highest quality and performance, SCS employs some of the world's foremost Parylene specialists who perform their work at state-of-the-art coating facilities in 11 countries worldwide. The company has over 45 years of experience developing customized solutions for clients who have a variety of requirements, including cost control and high-volume production schedules. SCS is trusted by many of the biggest names in the consumer electronics, aerospace, defense, transportation and medical device industries to provide critical protection of their advanced technologies.

**To learn more about Parylene conformal coatings and how SCS can help provide solutions to your protection challenges, contact us today.**

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