SCS AUTOMOTIVE COATINGS
Advanced protection for extreme environments.
INNOVATIVE SOLUTIONS FROM THE LEADER IN PARYLENE

With over 45 years of experience in Parylene engineering and applications, Specialty Coating Systems (SCS) is the world leader in Parylene conformal coating technologies. We’re a direct descendant of the companies that originally developed Parylene, and we leverage that expertise on every project – from initial planning to process application.

SCS employs some of the world’s foremost Parylene specialists, highly experienced sales engineers and expert manufacturing personnel, working in state-of-the-art coating facilities in 12 countries worldwide. Our extensive, proactive approach to production and quality requirements gives our customers peace of mind and minimizes the resources they need to meet even the most challenging requirements and specifications.

SCS PARYLENE COATINGS

SCS combines the properties of Parylene with its years of experience, vast technology and worldwide resources to provide the automotive industry with reliable coatings and services, including Parylene HT®, which is specifically engineered to withstand the most extreme conditions in the industry. Ultra-thin and pinhole-free, SCS Parylene coatings offer exceptional properties, including:

- Thermal stability up to 450°C (short-term)
- Superior fluid, chemical, moisture and electrical barrier properties
- Excellent crevice and multi-layer penetration
- Unparalleled ultraviolet stability
ENVIRONMENT-FRIENDLY COATINGS AND PROCESSES

SCS COMPLIES
As worldwide industry requirements and directives continue to evolve, SCS is at the forefront ensuring our products and services comply with relevant regulatory, environmental and biological standards.

SCS coating centers maintain AS9100 and ISO 9001 certifications. Additionally, SCS Parylenes comply with the European Union’s RoHS (Restriction of Hazardous Substances) Directive. SCS also has lead-free, halogen-free and low VOC initiatives to support our customers. For more information about SCS certifications and standards, visit SCScomplies.com.

PARYLENE COATING PROPERTIES THAT PROTECT

BARRIER PROPERTIES
SCS Parylene coatings are excellent moisture and chemical barriers for automotive components. Applied in the micron range — much thinner than industry standard coatings — Parylene provides a superior pinhole-free, uniform barrier to protect against corrosive liquids, fluids, gases and chemicals, even at elevated temperatures. Table 1 shows that Parylene HT films did not swell significantly with exposure to automotive chemicals and fluids. Additionally, there were no perceivable changes in the film’s visual or mechanical properties.

Circuit boards coated with SCS Parylene HT were salt-fog tested by an independent testing facility. The coated boards suffered no corrosion, salt or heavy iron oxide deposits after 144 hours of exposure in accordance with ASTM B117-(03) (See Figure 1). Boards coated with SCS Parylene C exhibited similar results.

THERMAL STABILITY
Harsh automotive operating environments range from -40°C to more than 300°C, making coating stability critical to the trouble-free life of vehicle electronics. SCS Parylene HT is specifically engineered to provide long-term thermal stability up to 350°C, with short-term stability up to 450°C.

UV STABILITY
SCS Parylene HT offers measurable UV stability after more than 2,000 hours of UV exposure (ASTM G154). Its chemical structure provides protection from degradation and discoloration as a result of such exposure.

DIELECTRIC PROPERTIES
SCS Parylenes also have excellent dielectric properties. Their high dielectric strength is attributable to the fact that they can be formed as thin, continuous films, free from the defects and fillers commonly found in conventional coatings that tend to reduce dielectric strength.

SCS Parylene HT has the lowest dielectric constant and dissipation factor among industry standard coatings, enabling it to transfer electric signals without absorption or loss.

TABLE 1: Automotive Chemical and Fluid Resistance of SCS Parylene HT

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Parylene HT Film Swelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automotive Fluids Heated to 90°C</td>
<td>&lt;2.5%</td>
</tr>
<tr>
<td>Antifreeze — 50% solution</td>
<td></td>
</tr>
<tr>
<td>Engine Oil — 10W30</td>
<td></td>
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<tr>
<td>Transmission Fluid — Dexron III Mercon</td>
<td></td>
</tr>
<tr>
<td>Automotive Chemicals Heated to 75°C</td>
<td>&lt;1%</td>
</tr>
<tr>
<td>Nitric Acid — 10% and 70% solutions</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid — 10% solution</td>
<td></td>
</tr>
<tr>
<td>Sulfuric Acid — 95% – 98% solution</td>
<td></td>
</tr>
<tr>
<td>Automotive Fluids at Room Temperature</td>
<td>&lt;1.5%</td>
</tr>
<tr>
<td>Brake Fluid — DOT 3</td>
<td></td>
</tr>
<tr>
<td>Power Steering Fluid</td>
<td></td>
</tr>
<tr>
<td>Windshield Washer Fluid</td>
<td></td>
</tr>
<tr>
<td>Unleaded Gasoline — 87 Octane</td>
<td></td>
</tr>
<tr>
<td>Diesel Fuel</td>
<td></td>
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</tbody>
</table>

Testing Parameters:
Film thickness: 16-20 micron
Exposure time: 120 minutes

METAL WHISKER MITIGATION
As a result of industry directives, pure metal plating is replacing lead in the solders used throughout the worldwide electronics industry. While safer for the environment, metal plating is known to form whiskers, which cause reliability problems for electronic systems. Parylene coatings suppress the formation of metallic whiskers, OSEs (odd shape eruptions) and dendrites.
SENSORS

Today’s engines and automotive systems rely on complex sensors to monitor the accuracy and operation of moving parts, fluid levels and pressures. Parylene’s excellent barrier properties protect critical sensors from harsh chemicals, fluids and gases, even in high temperature environments.

HYBRID AND FUEL CELL ELECTRONIC SYSTEMS

Many major automotive companies have developed hybrid vehicles that utilize and generate electricity to reduce the world’s reliance on oil for fuel. Parylene HT offers some of the best dielectric properties of protective coatings.

USEFUL IN MANY AUTOMOTIVE APPLICATIONS

SCS can apply Parylene coatings to virtually any surface material, including metals, resins, elastomers, plastics and ceramics, in thicknesses ranging from a few hundred angstroms to several mils. Parylene polymerizes as a uniform, thin-film coating that conforms to all surfaces, edges and crevices of a substrate, including the interior of multi-layer electronic packages. As a result of its ultra-thin application, Parylene adds little dimension or mass to critical, weight-sensitive components.

SEN SORS

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HYBRID AND FUEL CELL ELECTRONIC SYSTEMS

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coatings on the market — ensuring that the high level of power required for operating these hybrid electronic systems will not be weakened or distorted.

Fuel cells operate in the midst of corrosive compounds at elevated temperatures, a very harsh environment for electronics. Parylene HT is chemically structured to provide superior protection for these components.

MEMS
MicroElectroMechanicalSystems (MEMS) continue to represent the cutting-edge of automotive innovation, often replacing previous generation single-sensors. Today’s multi-capacity MEMS packages can be found controlling many critical automotive systems, including engine management, safety and security, tire pressure monitoring (TPMS), electronic stability, oil pressure, fuel injection, and pedestrian protection. Since Parylene is deposited as a gas, it is an ideal coating to protect complex MEMS wafers.

CIRCUIT BOARDS
SCS Parylene’s conformal and uniform nature ensures complete coverage of circuit boards to protect against corrosion and contaminants with no meniscus, flowing or edge-effects. The lightweight coating adds very little mass to even the smallest of circuit boards used in engine management systems, chip packaging and turbochargers.

THE PARYLENE PROCESS

SCS Parylene coatings are applied in a room temperature vacuum chamber via a vapor deposition polymerization (VDP) process. Components to be coated are only required to have a reasonable vacuum tolerance. There are no solvents, catalysts or plasticizers involved in the coating process and, since Parylene coatings require no elevated temperature cure cycle, there are no associated cure stresses. Unlike Parylene coatings, conventional dipped, sprayed or brushed coatings may require catalysts, cross-linking, elevated temperatures or UV cure cycles to improve coating properties.