

APPLICATION

Coating application is simple and straightforward. Shapes, tubing, pipe and bar may be tank-dipped. Sheets may be run through squeegee rollers or brushes. Field assemblies and repairs, joints, and welds may be brush or spray 'painted'. Coated products may be ambient air dried, or accelerated drying can be accomplished using forced air or drying ovens. In many cases manufacturers can modify existing plant equipment for the coating and drying process.

A flexible, **permanently bonded coating is produced**. The substrate's core physical attributes remain unaffected -- and more thoroughly protected -- by the grafted coating.

ENVIRONMENTAL CONSIDERATIONS

Formulations are environment-friendly and are aqueous solutions and emulsions. During the coating process the grafting and polymerization reactions proceed to completion so organic materials, including **VOC's, are virtually depleted in the reaction dynamics!**



Qovalent Corporation
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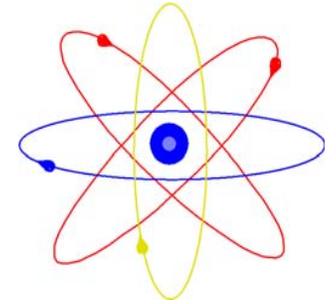
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Revolutionary Coating Technologies

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BENEFITS STATEMENT

SUBSTRATE, INC. (SI) has developed a family of distinctive coatings for carbon steel. The coatings are **unique**: being **chemically bonded to the substrate** (versus 'mechanical' bonding with current commercial coatings such as galvanizing, painting, epoxying, plating). **SI's** coating formulations provide a broad spectrum of surface property enhancements including corrosion protection and abrasion resistance. These superior coatings are economical, easy to apply and environment-friendly.

The unique characteristics of the coatings are the result of advanced chemical grafting technology. The coatings are polymeric films chemically bonded to the steel substrate via **SI's** formulations which include monomers, prepolymers, proprietary catalyst agents and graft initiators — and other ingredients providing a wide range of desirable attributes.

The graft initiator / catalyst system induces activation of the substrate surface — resulting in simultaneous primary **substrate::monomer covalent bonding** and secondary overall coating polymerization. This revolutionary breakthrough produces unprecedented value-added performance and business-building opportunities for our customers.

STANDARDS / TESTING

- **ASTM B117 - SALT SPRAY (FOG) TESTING**
Exposed for 1000 Hours; no sign of rusting.
- **ASTM D2794 - RESISTANCE OF COATINGS TO RAPID DEFORMATION (IMPACT)**
The maximum impact energy producing no cracking or loss of adhesion of the coating from the steel substrate was 122 inch pounds (intrusion) and 148 inch pounds (extrusion).
- **ROCKWELL HARDNESS**
Achieved Rockwell Hardness (HRB Scale) of 76 to 80.
- **AVERAGE SUPERFICIAL HARDNESS**
Rockwell (15T Scale) 85.3 to 86.6.
All of the above testing results were achieved with a coating thickness of approximately 0.001" (1 mil). This yields a coverage of 600 to 1000 square feet per gallon.
- ***ASTM D3359 - MEASURING ADHESION BY TAPE TEST**
Method A: X-Cut Tape Test
Results = 5A - No Peeling or Removal
Method B: Cross-Cut Tape Test
Results = 5B - No Failure
- ***ASTM D4541 - STANDARD TEST METHOD FOR PULL-OFF STRENGTH OF COATINGS USING PORTABLE ADHESION TESTERS**
Pull-Off Strength = 1150 psi

*ASTM D3359 - 0.0002" (0.2 mil) thickness
*ASTM D4541 - 0.0012" (1.2 mil) thickness

BACKGROUND

Chemical grafting is a process where one 'foreign' material becomes attached to another 'base' material (substrate) by means of a chemical bond and may be visualized as the growth of 'whiskers' onto the substrate. Conventional coatings 'sit' on the surface and adhere to substrates by weak mechanical forces which are easily broken (characterized as peeling, chipping, delamination). Voids, pinholes and other substrate irregularities cannot be completely protected by conventional coatings due to their molecular 'bulk' and the 'weak-force' attachment mechanism. This results in the accelerated failure of conventional coatings when exposed to moisture, salt, and other invasive substances in their environment.

SUBSTRATES's chemically grafted coatings achieve **complete, molecular-level, monomeric surface penetration** and **'strong-force' covalent bonding to the substrate** and can be modified to enhance desired properties such as coating thickness, corrosion and abrasion resistance, impact durability, UV protection, and pigmentation. Unlike conventional coatings, the grafted coatings provide permanent surface modification.