NACE Standards and Specifications Related to Oil & Natural Gas Infrastructure				
NACE Standard	**Title**	**Type**	**Scope**	**Notes**
SP21412-2016/SSPC-CPC 1	Corrosion Prevention and Control Planning	Standard Practice	This new standard on corrosion prevention and control (CPC) planning is intended to support future CPC improvements to national acquisition and sustainment of equipment, systems, facilities, and infrastructure at an acceptable cost. It provides a standardized framework for a supplier's plan to control corrosion of supplied products and structures. The standard is intended for use by public and private facility owners/acquisition agencies that require their suppliers to provide corrosion prevention and control procedures as a deliverable provided with the purchased product, installation, or system. The standard includes: • Attributes of the supplied product, system or facility that require planning for CPC; • Considerations for material selection and design of a product, system or facility to minimize corrosion; • Items or topics that should be addressed in a CPC plan; • Items or topics that should be addressed in CPC planning which affect CPC in design, fabrication and construction, operation and use, and maintenance and sustainability.	
SP21430-2019	Standard Framework for Establishing Corrosion Management Systems	Standard Practice	A corrosion management system (CMS) for assets is described in this Standard. The framework is intended to be applicable to a wide variety of asset types and is not focused on a particular industry or sector. Non-mandatory guidance is provided throughout this Standard to aid users with implementing the Standard. The framework in this Standard can be utilized to develop a stand-alone CMS or to integrate corrosion management into an organization's existing management system. Additionally, some processes covered in this framework may already be implemented by an organization, for example, management of change (MOC). An organization may modify their existing processes to address the elements identified in this framework.	
SP0169-2013	Control of External Corrosion on Underground or Submerged Metallic Piping Systems	Standard Practice	The cathodic protection criteria in this standard for achieving effective control of external corrosion on buried or submerged metallic piping systems are also applicable to other buried metallic structures. The standard includes information on determining the need for corrosion control; piping system design; coatings; cathodic protection criteria and design; installation of cathodic protection systems; and control of interference currents. The cost of corrosion control is also addressed in the appendixes.	Referenced by PHMSA in CFR 49 Parts 192 & 195
SP0102-2017	In-Line Inspection of Pipelines	Standard Practice	This standard outlines a process of related activities that a pipeline operator can use to plan, organize, and execute an in-line inspection (ILI) project. Guidelines pertaining to ILI data management and data analysis are included. A key companion guide to this standard is NACE International Publication 35100. This standard is intended for use by individuals and teams planning, implementing, and managing ILI projects and programs. These individuals include engineers, operations and maintenance personnel, technicians, specialists, construction personnel, and inspectors.	Referenced by PHMSA in CFR 49 Part 195
SP0204-2015	Stress Corrosion Cracking (SCC) Direct Assessment Methodology	Standard Practice	Addresses the situation in which a portion of a pipeline has been identified as an area of interest with respect to SCC based on its history, operations, and risk assessment process and it has been decided that direct assessment is an appropriate approach for integrity assessment. The standard provides guidance for managing SCC by selecting potential pipeline segments, selecting dig sites within those segments, inspecting the pipe and collecting and analyzing data during the dig, establishing a mitigation program, defining the reevaluation interval, and evaluating the effectiveness of the SCCDA process.	Referenced by PHMSA in CFR 49 Part 195
ANSI/NACE SP0502-2010	Pipeline External Corrosion Direct Assessment Methodology	Standard Practice	Covers the NACE external corrosion direct assessment (ECDA) process—a process of assessing and reducing the impact of external corrosion on pipeline integrity. ECDA is a continuous improvement process providing the advantages of locating areas where defects can form in the future, not just areas where defects have already formed, thereby helping to prevent future external corrosion damage. This standard covers the four components of ECDA: Pre-Assessment, Indirect Inspections, Direct Examinations, and Post Assessment.	Referenced by PHMSA in CFR 49 Parts 192 & 195
SP0170-2018	Protection of Austenitic Stainless Steels and Other Austenitic Alloys from Polythionic Acid Stress Corrosion Cracking During a Shutdown of Refinery Equipment	Standard Practice	Examines varying procedures used by industry to protect austenitic stainless steel equipment while idle. Basic protection methods include nitrogen purging, alkaline wash solutions, and dry air purging. Protection of reactors is also addressed.	Shutdown may be due to severe weather event
SP0176-2007 (formerly RP0176)	Corrosion Control of Submerged Areas of Permanently Installed Steel Offshore Structures Associated with Petroleum Production	Standard Practice	Provides guidelines for materials, practices, and methods of corrosion control for fixed offshore structures associated with petroleum production located in offshore areas. Includes information on three major areas: the submerged zone, the splash zone, and the atmospheric zone. Addresses structural design, cathodic protection criteria, design and installation of cathodic protection systems, control of interference currents, dielectric shields, surface preparation, coatings and inspection, and corrosion control records	Referenced by BSEE in CFR30 Part 250
SP0200-2014	Steel-Cased Pipeline Practices	Standard Practice	Details acceptable practices for the design, fabrication, installation, and maintenance of steel-cased metallic pipelines. It is intended for use by personnel in the pipeline industry.	

SP0207-2007	Performing Close-Interval Potential Surveys and DC Surface Potential Gradient Surveys on Buried or Submerged Metallic Pipelines	Standard Practice	Presents procedures for performing close-interval DC pipe-to-electrolyte potential surveys on buried or submerged metallic pipelines. This standard addresses the potential survey component of hybrid survey techniques such as trailing-wire DCVG or intensive measurement surveys, but does not address other surveys such as cell-to-cell techniques used to evaluate the direction of current or the effectiveness of the coating. This standard is intended for use by corrosion control personnel involved with operating pipelines, contractors performing close-interval surveys, corrosion professionals interpreting close-interval survey data, and regulatory agencies.	
SP0206-2016	Internal Corrosion Direct Assessment Methodology for Pipelines Carrying Normally Dry Natural Gas (DG-ICDA)	Standard Practice	This standard covers the NACE internal corrosion direct assessment (ICDA) process for normally dry natural gas pipeline systems. This standard is intended to serve as a guide for applying the NACE DG-ICDA process on natural gas pipeline systems that meet the feasibility requirements of this standard.	
SP0110-2018	Wet Gas Internal Corrosion Direct Assessment Methodology for Pipelines	Standard Practice	Formalizes the process of internal corrosion direct assessment (ICDA) for pipelines carrying natural gas with condensed water, or with water and liquid hydrocarbons, termed wet gas internal corrosion direct assessment (WG-ICDA). The two primary purposes of the WG-ICDA method are (1) to enhance the assessment of internal corrosion in natural gas pipelines, and (2) to improve pipeline integrity.	
SP0208-2008	Internal Corrosion Direct Assessment Methodology for Liquid Petroleum Pipelines	Standard Practice	Describes the basis of the liquid petroleum internal corrosion direct assessment (LP-ICDA) method and its four steps: (1) pre-assessment, (2) indirect assessment, (3) direct examination, and (4) post assessment. With the LP-ICDA approach, assessments can be performed on pipe segments for which alternative methods (e.g., in-line inspection, hydrostatic testing, etc.) may not be practical. This methodology may be incorporated into corrosion integrity and risk management plans.	
SP0507-2014	NACE/PODS Standard Practice External Corrosion Direct Assessment (ECDA) Integrity Data Exchange (IDX)	Standard Practice	The objective of this standard practice is the development of a new external corrosion direct assessment (ECDA) data interchange data structure in order to enable electronic integration of data and standardize reporting of ECDA data within the pipeline industry to allow transfer between different software packages or computer systems. This is expected to minimize difficulty in using various programs to analyze or graph data and allow for comparison of data gathered for a given pipeline segment at different times, regardless of the software system used to collect it. The format outlined is the commonly used American Standard Code for Information Interchange (ASCII) comma delimited text file, which is adaptable to all data processing systems. . This standard is expected to serve as a template for future internal corrosion direct assessment (ICDA) and stress corrosion cracking direct assessment (SCCDA) data interchange standards.	
SP0210-2010	Pipeline External Corrosion Confirmatory Direct Assessment	Standard Practice	This standard practice covers the NACE external corrosion confirmatory direct assessment (ECCDA) process for buried onshore ferrous piping systems. ECCDA is a continuous improvement process that was developed to improve pipeline safety, and it has the advantage and benefit of locating areas where corrosion is likely to occur in the future, not just areas where corrosion has already occurred. ECCDA can be used to validate previous assessment conclusions or determine if reassessment intervals are still appropriate, and the ECCDA process may detect additional pipeline integrity threats such as mechanical damage, stress corrosion cracking, and microbiologically influenced corrosion. This standard covers the four components of ECCDA: Preassessment, Indirect Inspection, Direct Examination, and Postassessment.	
SP0113-2013	Pipeline Integrity Method Selection	Standard Practice	Provides guidance on determining the appropriate integrity assessment method for diagnosing the corrosion threats recognized as part of a pipeline integrity process. The integrity assessment process in this standard is specifically intended to address buried onshore pipelines constructed from ferrous materials.	
SP0116-2016	Multiphase Flow Internal Corrosion Direct Assessment (MP-ICDA) Methodology for Pipelines	Standard Practice	This standard describes the NACE International internal corrosion direct assessment (ICDA) process for multiphase flow pipeline systems. Intended to serve as a guide for applying the MP-ICDA process to these types of pipeline systems, this standard outlines a methodology to assess pipeline integrity because of the threat of internal corrosion. This standard applies to both onshore and offshore pipelines containing CO2, H2S, and O2. Included in this standard are several figures detailing the steps in the MP-ICDA assessment process and tables containing data and selection criteria. There are also three appendices for additional information.	
SP0775-2018	Preparation, Installation, Analysis, and Interpretation of Corrosion Coupons in Oilfield Operations	Standard Practice	Encourages the use of uniform, industry-proven methods to monitor corrosion in oil production systems. Outlines procedures for preparing, analyzing, and installing corrosion coupons. Corrosion rate calculations and a typical form for recording data are also included.	
SP0491-2012	Worksheet for the Selection of Oilfield Nonmetallic Seal Systems	Standard Practice	Provides guidelines and a worksheet to be used in selecting nonmetallic seal materials for oilfield applications. Chemical, thermal, and pressure conditions that exist in the environment must be outlined, and this standard is intended to aid and formalize this outlining procedure.	
SP0291-2017	Care, Handling, and Installation of Internally Plastic-Coated Oilfield Tubular Goods and Accessories	Standard Practice	This standard recommended practice covers the care, handling, transportation, and installation of internally plastic-coated (IPC) oilfield tubular goods and accessories (IPC material). It presents guidelines for the proper care, handling, and installation of IPC oilfield tubular goods and accessories.	

SP0191-2017	The Application of Internal Plastic Coatings for Oilfield Tubular Goods and Accessories	Standard Practice	This standard recommended practice covers the care, handling, transportation, and installation of internally plastic-coated (IPC) oilfield tubular goods and accessories (IPC material). It presents guidelines for the proper care, handling, and installation of IPC oilfield tubular goods and accessories.	
SP21424-2018	AC Corrosion on Cathodically Protected Pipelines: Risk Assessment, Mitigation, and Monitoring	Standard Practice	This standard practice presents guidelines and procedures for use during risk assessment, mitigation, and monitoring of corrosion on underground, cathodically protected steel piping systems caused by proximity to alternating current (AC) power supply systems. As shared right-of-way and utility corridor practices become more common, AC influence on adjacent metallic structures has greater significance, and corrosion due to AC influence becomes of greater concern. This standard is not intended to supersede or replace existing corrosion control standards, but rather to complement these standards when the influence of AC-powered systems becomes significant.	
SP0313-2013	Guided Wave Technology for Piping Applications	Standard Practice	A guided wave is created by restricting the propagation of sound or electromagnetic waves in one or two dimensions. A particular frequency of the wave can travel -- with little attenuation -- for very long distances. Changes in the dimensions of the restrictions can cause partial reflections that can be analysed to find the location of the change. In 1998, pipeline operators began to use a form of instrumented inspection technology that has evolved into what is known at present as guided wave testing (GWT), which detects changes in the cross-sectional area of the pipe wall. Test equipment software provides a percent estimate of the change (gain or loss) and is often expressed as percent estimated cross-sectional loss. These changes include metal loss indications, anomalies, or defects such as corrosion, gouges, etc., or metal pickup such as welds, valves, flanges, etc. When properly applied, GWT can monitor cross-sectional loss over time, and provide economic benefits and efficiencies in integrity assessments.	
SP0106-2018	Control of Internal Corrosion in Steel Pipelines and Piping Systems	Standard Practice	This standard presents recommended practices for the control of internal corrosion in steel pipelines and piping systems used to gather, transport, or distribute crude oil, petroleum products, or gas. It is meant to serve as a guide for establishing minimum requirements for control of internal corrosion in crude oil gathering and flow lines, crude oil transmission, hydrocarbon products, gas gathering and flow lines, gas transmission, and gas distribution.	
SP0181-2006	Liquid-Applied Internal Protective Coatings for Oilfield Production Equipment	Standard Practice	Provides guidelines for obtaining an effective internal lining to protect against general or pitting corrosion of metal tanks and vessels commonly used in oilfield operations at atmospheric and elevated pressures. Also included are various factors required to obtain satisfactory linings in equipment design and fabrication considerations, lining selection, surface preparation, lining application, and inspection.	
SP0185-2007	Extruded Polyolefin Resin Coating Systems with Soft Adhesives for Underground or Submerged Pipe	Standard Practice	Details materials and methods of application for two types of polyolefin resin coating systems extruded over soft adhesives on pipe for underground or submerged service. The standard addresses surface preparation, application methods, electrical inspection, pipe handling techniques, and coating system repair methods. The two types of coating systems are (1) polyolefin resin that is crosshead-extruded on the pipe as a seamless coating over a hot-applied mastic adhesive and (2) polyolefin resin that is extruded spirally around the pipe to fuse and form as a seamless coating over an extruded butyl-rubber adhesive.	
SP0375-2018	Field-Applied Underground Wax Coating Systems for Underground Metallic Pipes: Application, Performance, and Quality Control	Standard Practice	This NACE International standard practice includes guidelines for surface preparation, material requirements, application, and handling of hot- and cold-applied wax and component wrappers and wax-based tape coating systems for the protection of underground pipe, fittings, and valves. The standard outlines material requirements for hot- and cold-applied wax coatings, and handling of the coated components, and includes five tables that provide material requirements and references to standard test methods for the various coating materials discussed. This standard is intended for use by corrosion control personnel, design engineers, project managers, purchasers, and construction engineers and managers.	
SP0304-2016	Design, Installation, and Operation of Thermoplastic Liners for Oilfield Pipelines	Standard Practice	This NACE International standard practice defines the process necessary to design, install, and operate a thermoplastic-lined oilfield pipeline and provides a foundation for proper use of thermoplastic liners in cases where there is no established standard. It is not intended to replace existing national or corporate standards and requirements based on specific local experience. This standard is intended for use by liner installers, owners of lined pipelines and pipelines that might at some point need a liner, liner materials suppliers, and consultants, and engineering firms engaged in the subject field. The intent is that project specifications be developed based on this standard. The standard provides a common design basis consistent with best engineering practices. It is to the benefit of liner users and installers to have a standard for liner design, installation, and operation to help ensure that the installed product meets performance expectations. This standard represents minimum requirements and should not be interpreted as a restriction on the use of better procedures or materials.	

SP0186-2007	Application of Cathodic Protection for External Surfaces of Steel Well Casings	Standard Practice	Identifies the procedures used to determine the need for cathodic protection and current requirements for well casings associated with oil and gas production and gas storage. The standard also outlines practices for the design and installation of cathodic protection systems and for their operation and maintenance. The standard applies only to well casing exteriors.	
SP0286-2007	Electrical Isolation of Cathodically Protected Pipelines	Standard Practice	Fully details the requirements necessary to ensure adequate isolation of cathodically protected pipelines, especially those with high-quality dielectric coatings. The standard was developed as a supplement to SP0169 and SP0177. It includes sections on the need for electrical isolation, methods of electrical isolation, comparison of devices available for pipeline isolation, and equipment specification and installation, as well as field testing and maintenance.	
ANSI/NACE SP0115-2015/ISO 15589-2 (Modified)	Petroleum, petrochemical, and natural gas industries – Cathodic protection of pipeline transportation systems – Part 2: Offshore pipelines	Standard Practice	This standard specifies requirements and gives recommendations for the pre-installation surveys, design, materials, equipment, fabrication, installation, commissioning, operation, inspection and maintenance of cathodic protection (CP) systems for offshore pipelines for the petroleum, petrochemical and natural gas industries as defined in ISO 13623. It is applicable to carbon steel, stainless steel and flexible pipelines in offshore service, and to retrofits, modifications and repairs made to existing pipeline systems.	
SP0575-2007	Internal Cathodic Protection (CP) Systems in Oil-Treating Vessels	Standard Practice	Presents a general guide for application of effective cathodic protection to all oil-treating vessels. Includes design criteria, selection, and installation of applicable systems, and the operation, monitoring, and maintenance of installed systems.	
SP0572-2007	Design, Installation, Operation, and Maintenance of Impressed Current Deep Anode Beds	Standard Practice	Presents procedures and practices for design, installation, operation, and maintenance of deep groundbeds used for control of external corrosion of underground or submerged metallic structures by impressed current cathodic protection.	
ANSI/NACE MR0175/ISO 15156-2015	Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gs production	Material Requirement	NACE MR0175/ISO 15156 gives requirements and recommendations for the selection and qualification of carbon and low-alloy steels, corrosion-resistant alloys, and other alloys for service in equipment used in oil and natural gas production and natural gas treatment plants in H2S-containing environments, whose failure could pose a risk to the health and safety of the public and personnel or to the equipment itself.	Referenced by BSEE in CFR30 Part 250
MR0176-2012	Metallic Materials for Sucker-Rod Pumps For Corrosive Oilfield Environments	Material Requirement	Specifies metallic material requirements for the construction of sucker-rod pumps for service in corrosive oilfield environments. Gives tables of recommended materials for mild, moderate, and severe metal-loss corrosion environments, as well as tables of typical mechanical properties of pump barrel materials and plunger materials. Includes appendices on case hardening processes for steel pump barrels for an H2S environment and selection of optimum type of pump.	
35100 (2012 Edition)	In-Line Inspection of Pipelines	Report	The purpose of this technical committee report is to analyze available and emerging technologies in the field of in-line inspection tools and review their status with respect to characteristics, performance, range of application, and limitations. It is intended as a practical reference for both new and experienced users of ILI technology.	
21410 (2016)	Selction of Pipeline Flow and Internal Corrosion Models	Report	The purpose of this technical committee report is to analyze available and emerging technologies in the field of in-line inspection tools and review their status with respect to characteristics, performance, range of application, and limitations. It is intended as a practical reference for both new and experienced users of ILI technology.	
10A292 (2013)	Corrosion and Corrosion Control for Buried Cast- and Ductile-Iron Pipe	Report	Discusses techniques and methods used to mitigate corrosion of iron pipe and fittings, including engineering practices for ductile- and cast-iron pipe, reported protective measures and their results, influences of the different properties of the two types of iron pipe, and case histories of installations spanning decades in a wide range of soils.	
1D177 (2009 Edition)	Monitoring Techniques and Corrosion Control for Drill Pipe, Casing, and Other Steel Components in Contact with Drilling Fluids	Report	This state-of-the-art report includes descriptions of corrosion inhibition programs that have been used on drilling rigs in many different areas. Field information from tests evaluating corrosion control of drill pipe, casing, and steel components in contact with various drilling fluids is incorporated and presented.	
31014 (2014)	Field Monitoring of Corrosion Rates in Oil and Gas Production Environments Using Electrochemical Techniques	Report	Application of corrosion inhibitors is one of the primary internal corrosion control strategies for carbon steel infrastructure in oil and gas production. Periodic monitoring of corrosion is an essential part of corrosion control.	
1F192 (2013 Edition)	Use of Corrosion-Resistant Alloys in Oilfield Environments	Report	This report brings together state-of-the-art knowledge covering experiences in the application of Corrosion Resistant Alloys (CRAs) and issues of welding, fabrication, and assessment for successful operation in oil and gas production environments with specific consideration of corrosion and environmentally assisted cracking, and it highlights technology gaps impacting the industry.	
35101 (2001)	Plastic Liners for Oilfield Pipelines	Report	Provides an overview of thermoplastic liners used in oilfield pipelines, and reflects current practices. This report is intended to assist those who are considering the use of liners, but have only limited access to resources with knowledge of the terminology, techniques, and applications of liners in the oil field.	

61114	Underdeposit Corrosion (UDC) Testing and Mitigation Methods in the Oil and Gas Industry	Report	This technical committee report presents an overview of the various methods used in the oil and gas industry to test and mitigate under deposit corrosion (UDC) occurring in corrosive pipeline environments when solids are present and carbon steel is used. The testing techniques are different in nature and in design and therefore assess and evaluate UDC in different ways. The objective is to provide industry users with some tools and means from which to choose when confronted with such an issue.	
3T199 (2012 Edition)	Techniques for Monitoring Corrosion and Related Parameters in Field Applications	Report	Analyzes the various techniques for assessing corrosion in the field. New topics included in this revision are: long-range ultrasonic testing (UT), fiber optic strain gauges; high-resolution electrical resistance (ER), a new method of hydrogen probe monitoring, and extended-analysis coupons. The report is divided into discussions of direct techniques, both intrusive and nonintrusive, and indirect techniques, both online and off-line. It provides an understanding of the practical aspects of each technique, and is also helpful in assessing less commonly used techniques, or the implications of using a familiar technique in a totally different operating environment.	
TM0497-2018	Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems	Test Method	This standard test method provides descriptions of the measurement techniques and cautionary measures most commonly used on underground and submerged piping other than offshore piping to determine whether a specific criterion has been met at a test site. This standard contains instrumentation and general measurement guidelines. It includes methods for voltage drop considerations when structure-to-electrolyte potential measurements are made and provides guidance to minimize incorrect data from being collected and used.	
TM0298-2015	Evaluating the Compatibility of FRP Pipe and Tubulars with Oilfield Environments	Test Method	Provides a means to evaluate the relative resistance of most fiber-reinforced plastic (FRP) pipe and tubular products to specific oilfield environments by comparison of apparent tensile strength before and after exposure. Gives recommendations on the reagents to be used, describes the test specimens and test equipment to be used, and gives the test procedures to be followed. The standard describes seven environment categories.	
TM0109-2009	Aboveground Survey Techniques for the Evaluation of Underground Pipeline Coating Condition	Test Method	Presents various techniques for aboveground evaluation of the coating condition of underground metallic pipelines, including the alternating current (AC) attenuation survey, direct current (DC) survey, AC-voltage gradient survey, and the Pearson survey. This standard is specifically intended to address buried onshore metallic pipelines and is based on available technology and methods that have successfully demonstrated evaluation of the coating condition of buried pipelines.	
TM0212-2018	Detection, Testing, and Evaluation of Microbiologically Influenced Corrosion on Internal Surface of Pipelines	Test Method	Microbiologically influenced corrosion (MIC) is corrosion affected by the presence or activity (or both) of microorganisms in biofilms on the surface of the corroding material. This NACE standard test method applies to the internal surfaces of pipelines, and describes types of microorganisms, mechanisms by which MIC occurs, methods for sampling and testing for the presence of microorganisms, research results, and interpretation of test. Sections 1 through 4 of this standard discuss the technical aspects of MIC. Sections 5 through 7 discuss field equipment and testing procedures. This standard is intended for use by pipeline operators, pipeline service providers, government agencies, and any other persons or companies involved in planning or managing pipeline integrity.	
TM0172-2015	Determining Corrosive Properties of Insoluble Petroleum Product Pipeline Cargoes	Test Method	This standard provides a procedure for conducting a test to determine the corrosive properties of gasoline and distillate fuels in preparation for transport through a pipeline. Also included is information on test specimen preparation, equipment, and a system for rating the test specimens.	
TM0106-2015	Detection, Testing, and Evaluation of Microbiologically Influenced Corrosion (MIC) on External Surfaces of Buried Pipelines	Test Method	This standard describes types of microorganisms, mechanisms by which MIC occurs, methods of testing for the presence of bacteria, research results, and interpretation of testing results for external surfaces of buried, ferrous-based metal pipelines and related components. Appendixes are included for media specifications (nonmandatory Appendix A), dilution procedures (nonmandatory Appendix B), and site inspection and testing (nonmandatory Appendix C).	
TM0174-2002	Laboratory Methods for the Evaluation of Protective Coatings and Lining Materials In Immersion Service	Test Method	Provides guidelines to help manufacturers and users of protective coatings select materials by providing standard test methods for evaluating protective coatings used as linings for immersion service. This standard provides two test methods for evaluating protective coatings on any substrate, such as steel, copper, aluminum, etc., so the factors of both chemical resistance and permeability can be considered.	