ELECTROCHEMICAL CORROSION TESTING

"Guarantee product reliability and extend service life."

Electrochemical corrosion testing is a vital technique used to evaluate the corrosion behavior of metals and alloys in specific environments. By simulating real-world conditions, this testing method provides valuable insights into material performance, aiding in the identification of potential weaknesses and improving the design of corrosion-resistant products. It ensures compliance with industry standards and enhances long-term material reliability in critical applications.

POTENTIODYNAMIC CORROSION

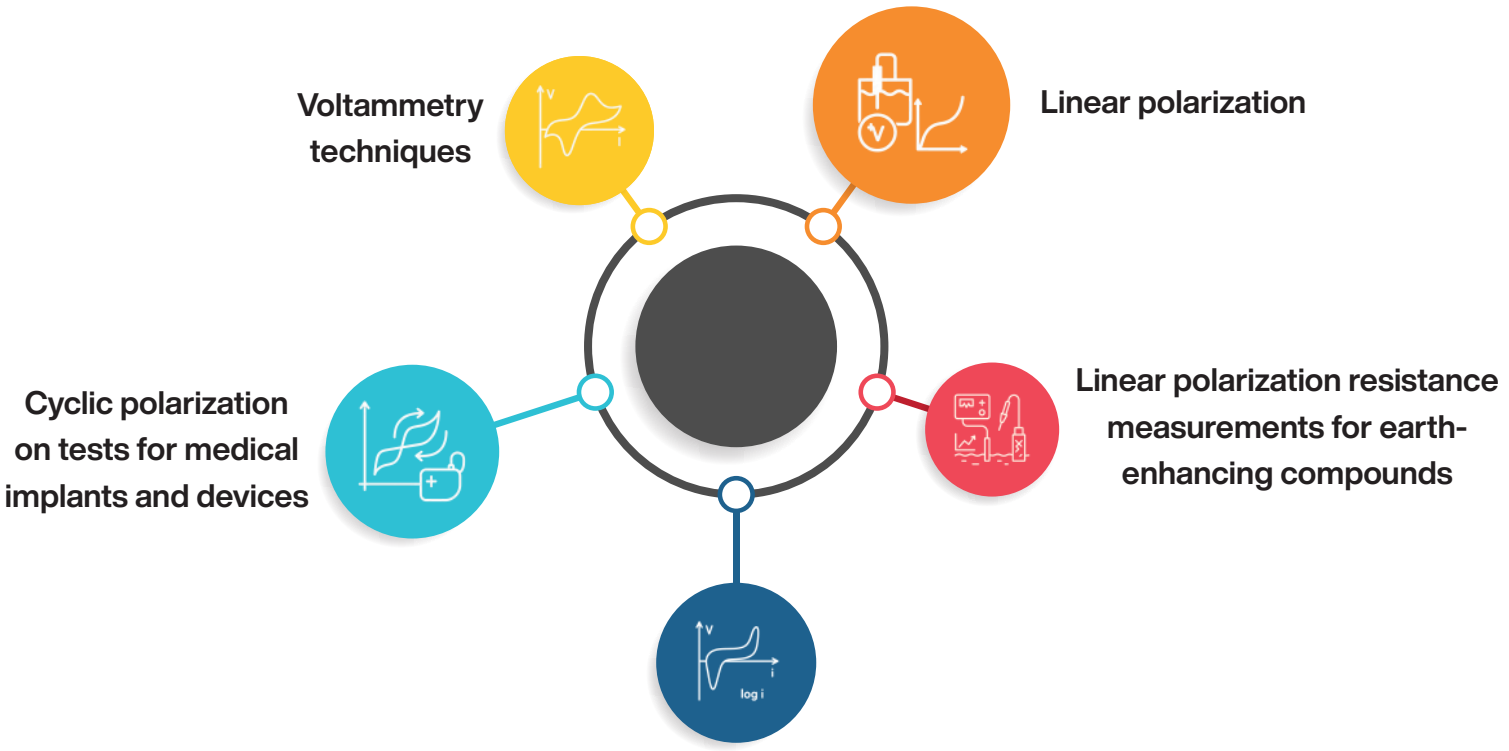
Potentiodynamic Corrosion Rate Measurement and Evaluation Techniques

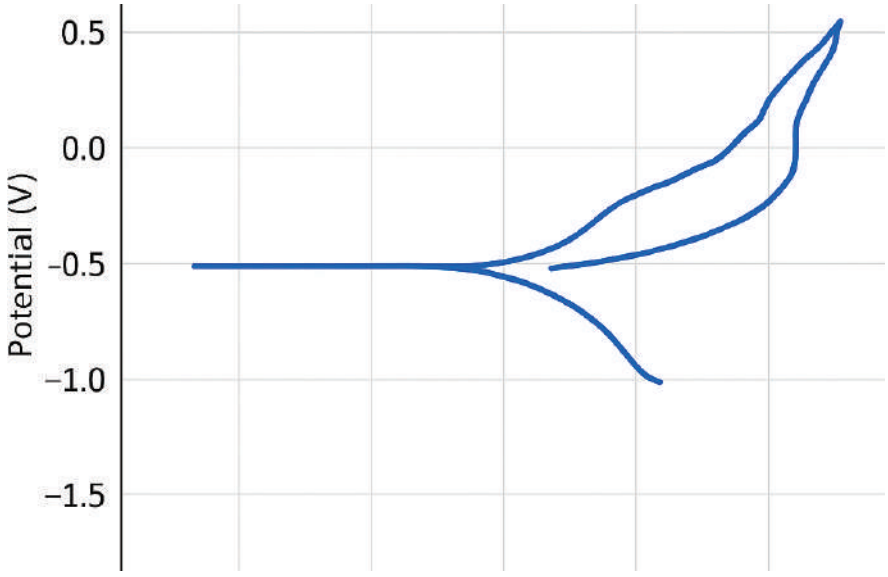
Mett-Bio's wide array of metallurgical testing and repair services boasts a sophisticated instrument that calculates electrochemical measurements within metals and alloys. We use this equipment to study material-degrading electrochemical reactions, eventually helping prevent and combat corrosion scenarios.

Why Use Potentiodynamic Techniques?

Potentiodynamic techniques assist in acquiring electrochemical measurements. These specific measurements allow for a thorough evaluation of the corrosion rate, growth, and root cause.

At Mett-Bio, we carry out the following types of potentiodynamic measurements:

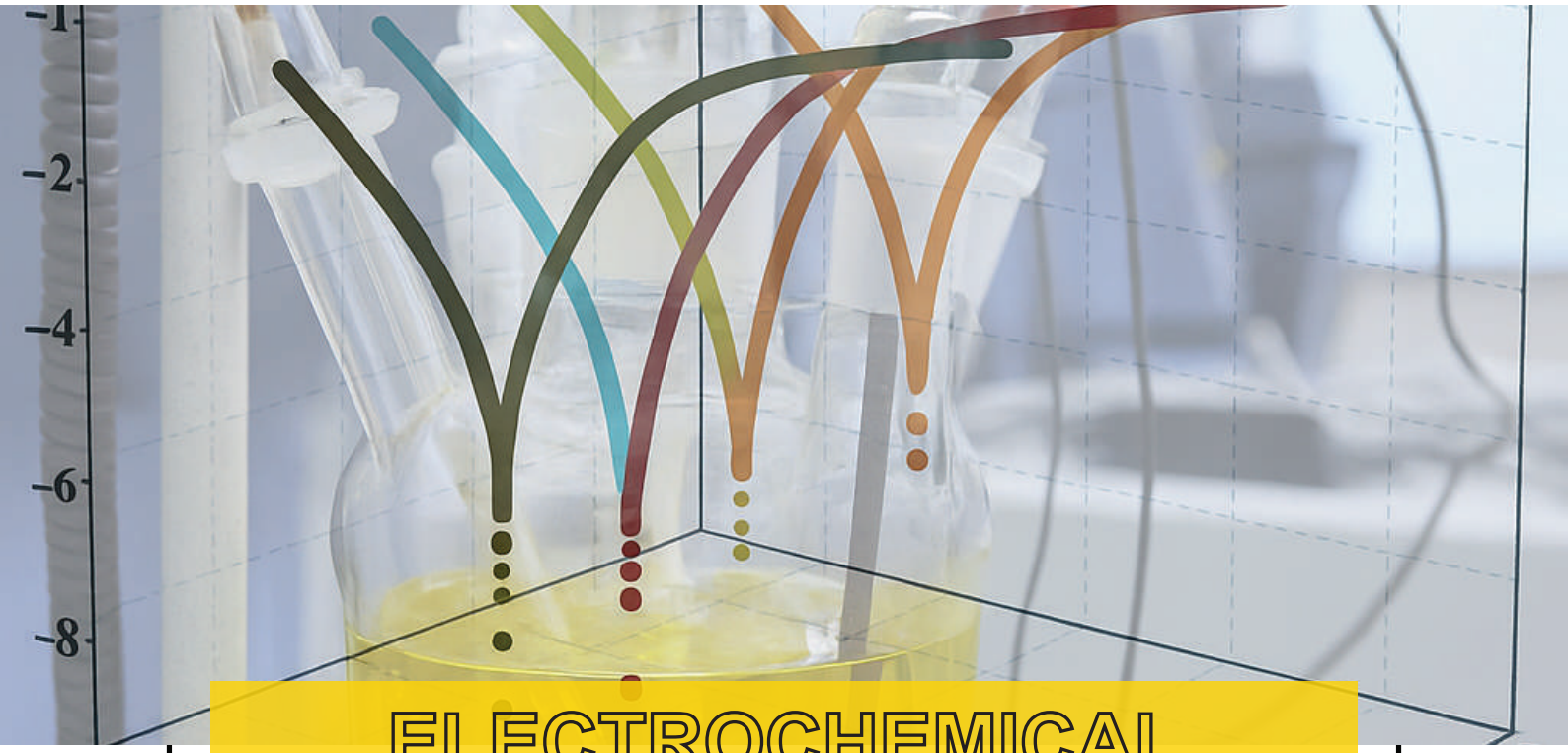




These techniques are commonly used for R&D purposes, mainly for assessing the alterations

in a metal or alloy in a set corrosive environment. Moreover, they are practised in educational

institutions, along with industries ranging from chemical, petrochemical, power, and medicine.



ELECTROCHEMICAL CORROSION

01 Linear Potentiodynamic

02 Cyclic Potentiodynamic

03 Potentiostatic
Evaluating Corrosion Stability at a Constant

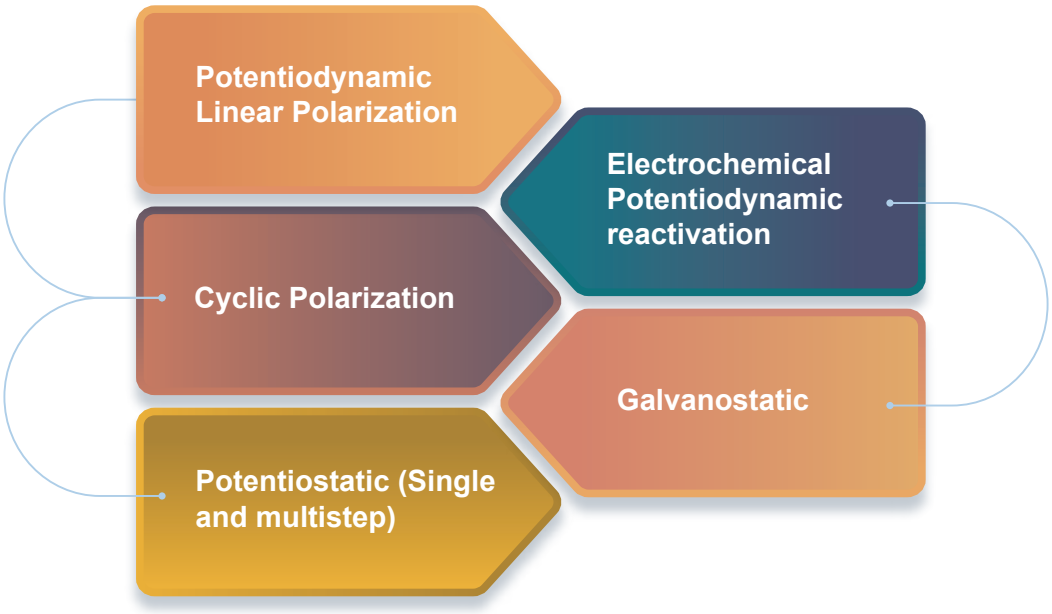
Our electrochemical testing laboratory provides comprehensive corrosion evaluation services. By employing accelerated corrosion techniques, we accurately assess the type, severity, and impact of corrosion on metals and alloys.

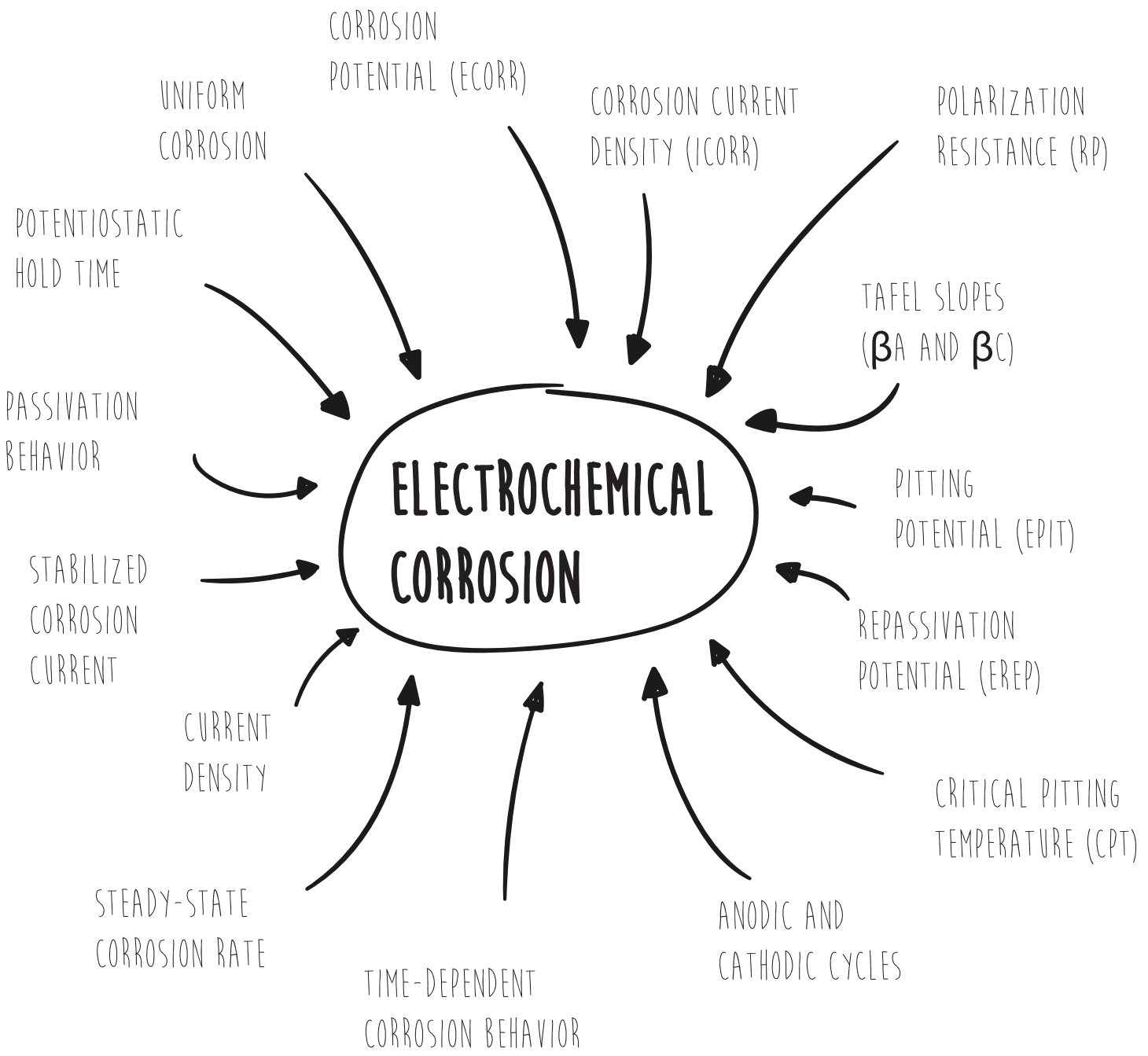
Our testing procedures rigorously adhere to industry standards, including linear and cyclic Potentiodynamic polarization resistance measurements.

Typical applications of this experiment include

- Comprehensive Analysis of Corrosion Susceptibility in Metallic Components and Materials
- Conducting comparative Study of Materials, Processes, and Surface Treatments
- Evaluating Material, Processing, and Surface Treatment Impacts
- Investigating Corrosion Resistance for Material Selection, Processing Effects, and Surface Modifications
- Bimetallic and Material Corrosion to analyse Galvanic Effects, Surface Treatments, and Processing Techniques

Electrochemical tests performed at Mett-Bio are:



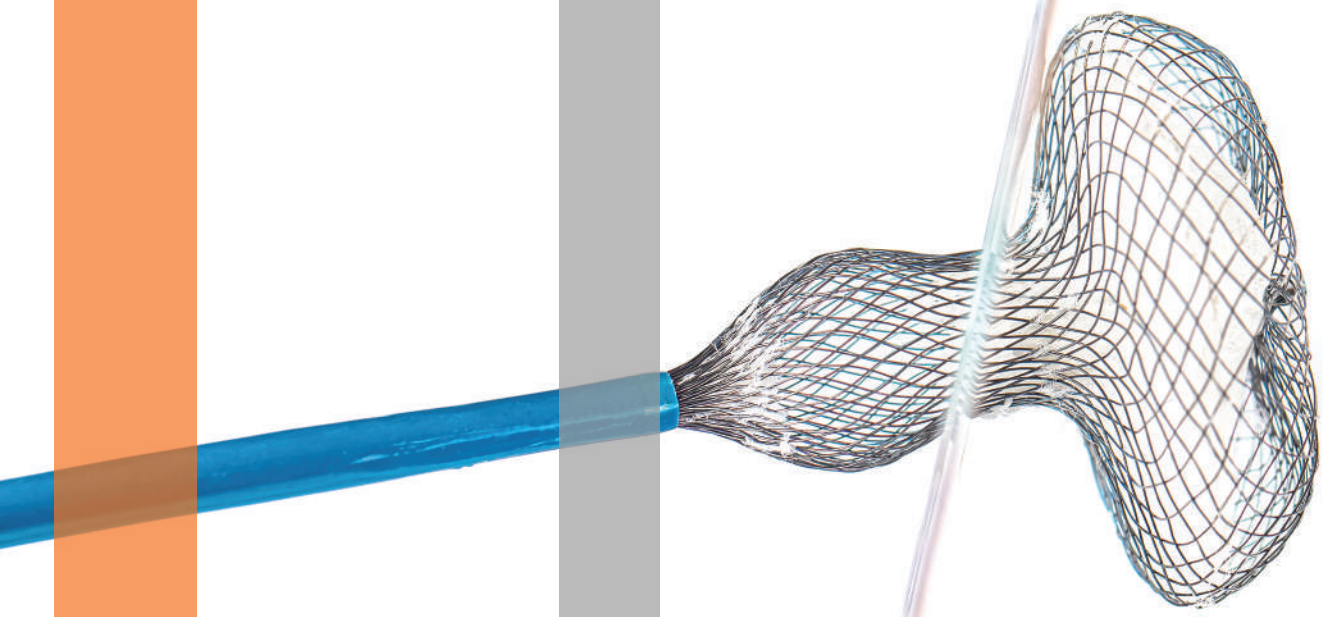

ELECTROCHEMICAL CORROSION
UNIFORM CORROSION
CORROSION POTENTIAL (ECORR)
CORROSION CURRENT DENSITY (ICORR)
POLARIZATION RESISTANCE (RP)
POTENTIOSTATIC HOLD TIME
TAFEL SLOPES (βA AND βC)
PASSIVATION BEHAVIOR
PITTING POTENTIAL (EPIT)
STABILIZED CORROSION CURRENT
REPASSIVATION POTENTIAL (EREP)
CURRENT DENSITY
CRITICAL PITTING TEMPERATURE (CPT)
STEADY-STATE CORROSION RATE
TIME-DEPENDENT CORROSION BEHAVIOR
ANODIC AND CATHODIC CYCLES

CORROSION POTENTIALS OF UNCOATED REINFORCING STEEL IN CONCRETE

This test procedure is designed to evaluate the corrosion potential of uncoated reinforcement steel embedded in laboratory-prepared concrete and in-situ concrete. By assessing corrosion activity, this method provides valuable insights into the long-term durability of concrete structures. The procedure is applicable to all sizes of concrete members and reinforcement cover depths, making it a versatile tool for corrosion evaluation throughout the service life of a structure. It is important to note that the test results should not be interpreted as a direct assessment of the structural integrity of the steel or reinforced concrete element.

Our qualified engineers and technicians, with expertise in concrete materials and corrosion testing, meticulously analyze potential measurements. By considering factors such as chloride content, carbonation depth, delamination, corrosion rate, environmental exposure, and corrosion potential, they provide informed conclusions regarding the corrosion activity of embedded steel and its potential impact on the structural integrity and service life of the structure.

GALVANIC CORROSION - MEDICAL IMPLANTS



The test method is a standardized procedure used to evaluate galvanic corrosion between dissimilar metals in medical devices, particularly in modular implants such as orthopedic joint replacements. This test is significant because it simulates physiological conditions to assess the potential for corrosion when different metallic components come into contact within the human body. Galvanic corrosion can compromise the structural integrity and biocompatibility of implants, potentially leading to device failure or adverse biological reactions.

Manufacturers can ensure device safety, longevity, and regulatory compliance through reliable, reproducible corrosion testing.

CORROSION POTENTIAL ASSESSMENT

01

Solution heat treating and annealing

02

Extent of precipitation during artificial ageing and welding

03

Extent of diffusion of alloying elements from the core into the cladding of Alclad products

The corrosion potential of an aluminum alloy is influenced by its alloying elements in solid solution. Copper makes the alloy more noble (positive potential), while zinc makes it more active (negative potential). Measuring corrosion potential is useful for evaluating the metallurgical condition of aluminum alloys, particularly those containing copper or zinc, and can help assess the effectiveness of heat treatments, aging, welding, and element diffusion in aluminum products.

GALVANIC CORROSION - MEDICAL DEVICES

01

Orthopedic Implants

Such as hip and knee replacements where different metals are used.

02

Dental Implants

Involving various metal alloys that may come into contact.

03

Cardiovascular Devices

Including stents and pacemakers that utilize multiple metallic components.

The test method for evaluating the potential for galvanic corrosion in implantable medical devices made from dissimilar metals. This test is essential as such devices may experience electrical contact between different metal components, which can lead to galvanic corrosion. This phenomenon can result in the release of harmful corrosion products or compromise the structural integrity of the device, posing significant risks to patient safety.

The test standard provides a systematic approach to assess the susceptibility of these devices to galvanic corrosion, thereby informing manufacturers about potential risks and guiding them in designing safer medical implants.