



Electrochemistry in Corrosion Research

12 - 14 November 2025, Zofingen Switzerland

Program

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 **Metrohm**
Schweiz AG

Electrochemistry in Corrosion Research Workshop

Date: 12 - 14 November 2025 (3 days)

Venue: Zofingen, Switzerland

Course Description

This course introduces the basic principles of electrochemistry, focusing on corrosion research. It covers the basics of corrosion testing and monitoring techniques, such as linear polarization, cyclic voltammetry and electrochemical impedance spectroscopy (EIS) for routine applications such as rapid screening of corrosion inhibitors, materials selection, failure analysis, corrosion rate measurement, life prediction, evaluation of paints, coatings, electroplating, determination of resistance to local corrosion such as pitting and crevice corrosion and studies of passivating system.

Introduction to Corrosion

The basics of the electrochemical theory of corrosion will be presented: corrosion reactions, electrochemical nature of corrosion, electrode potential (half cells, corrosion cells), electrochemical kinetics (charge transfer and mass transport control), corrosion in acids, corrosion in neutral solutions.

Module 1 Uniform corrosion rate

The theoretical concepts and the experimental issues underlying the measurement of uniform corrosion rates using electrochemical methods will be discussed: Tafel extrapolation, polarisation resistance, reference electrodes, galvanostatic and potentiostatic methods, potential drops due to ohmic resistance of the solution, sample preparation.

Module 2: Passivity and localized corrosion

The basics of metals/alloys passivation mechanisms including a short presentation of the most relevant characterization methods (electrochemical/surface analytical) to assess oxide film growth, stability and composition will first be introduced. The passivity breakdown and different localized corrosion propagation mechanisms will then be described. Critical controlling factors such as environment and aggressive ion types but also examples of alloying element influence will finally be discussed.

In the second part, concepts and dedicated electrochemical methods/setup related to crevice corrosion and aeration cells will be discussed. The theory and measurement of oxygen concentration/diffusion control will briefly be introduced in relation with the lab work.

Module 3: Electrochemical Impedance Spectroscopy

This module will be focused on the method of Electrochemical Impedance Spectroscopy. The basics on AC and DC electronic circuit and how this can be correlated to real electrochemical cases will be taught. It will be based on concrete examples to see how to extract practical information on the system, based on impedance measurements. Programming on the NOVA software and the best parameters of the EIS measurements will also be discussed.

Workshop Content

Theory	(30%)
Practical and trouble shooting	(70%)

Workshop Cost

CHF 1000.00 – Industry
CHF 550.00 – Student *

* The course entitles for a credit in the Doctoral Program in Material Science of EPFL.
The workshop includes seminar materials, USB stick, lunches and one welcoming dinner.

Organizer

Metrohm Schweiz AG

Collaborators and Trainers

Empa, Dübendorf – Dr Patrik Schmutz
EPFL, Lausanne – Dr Stefano Mischler
EPFL, Lausanne – Dr Anna Igual Munoz
Petroneas Lubricants Italy – Dr. Fabio Cova Caiazza

With the support of
Dr. Teresa Nathan Walleser, Metrohm Schweiz AG
Ms Nisarga Mysuru, Metrohm Schweiz AG

Course Program

Day 1

11:00 - 11:30	Welcome and Icebreaking session and grouping.
11:30 - 12:30	Introduction for corrosion (theory) – Dr Mischler
12:30 - 14:00	Lunch
14:00 - 14:30	Nova Crash Course
14:30 - 15:15	Module 1 (Dr Mischler) Uniform corrosion rate – theory Technique Introduction (Tafel Plot) and Sample preparation
15.15 - 15:30	Coffee Break
15.00 - 18.00	Practical Work 1 – Corrosion Analysis, screening of corrosion inhibitors, SS in HCl PW1: Uniform corrosion and corrosion inhibition.
19:00	Welcoming Dinner

Day 2

8:30 - 9:45	Module 2 (Dr Schmutz) Passivity and Localized corrosion, pitting corrosion
9:45 - 10:00	Coffee Break
10:00 - 12:30	Practical Work 2 - Passivity and Localized corrosion, pitting corrosion PW2: Pitting corrosion investigation.
12:30 - 14:00	Lunch
14:00 - 14:45	Crevice Corrosion, Aeration Cell, Oxygen kinetics
14.45 - 15.00	Coffee Break
15.00 - 18.30	Practical Work 3 – Rotating Disk Electrode PW3: Investigation of Oxygen Controlled Corrosion using Rotating Disk Electrode (RDE).

Day 3

8:30 - 9:45	Module 3 (Dr Igual Munoz) Characterization of Anodic Film and coated system – Theory (DC and AC method) Electrochemical Impedance Spectroscopy (EIS) EIS circuit – fit and simulation demo
9:45 - 10:00	Coffee Break
10:00 - 12:30	Practical Work 4– Electrochemical Impedance Spectroscopy PW4: Electrochemical Impedance Spectroscopy applied to the evaluation of protective coatings.
12:30 - 14:00	Lunch
14:00 - 15:30	Experiment Presentation and Discussion Case Study Presentation (Participants can bring their own or will be given one)
15:30 - 15.45	Coffee Break
15:45 - 16.30	Summary, Review, Q&A, Certificate presentation End

Course Preparation

Please kindly take note that on 14 November after lunch, there will be the Experiment Presentation and Discussion Session. During this session, besides, presenting your findings, you are also required to do a case study presentation where you may bring your own case or you will be given one. The schedule and detail of this session will be discussed in detail during the course.

Since the course involves practical work as well, so therefore, please bring along your goggles and lab coat/jacket. Otherwise, we will provide them.



Click or scan for registration



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