

One part of the course is dedicated to surface treatments of metals for the creation of various surface mechanical and functional properties, including corrosion protection. The concept of a metal surface is discussed and the importance of surface properties is emphasized. Examples of corrosion are given to illustrate the importance of surface processing for metal protection. Various types of surface treatments are explained and illustrated by research related case studies:

- Electrochemical conversion,
- Chemical deposition / passivation,
- Electrolytic conversion,
- Metal deposition.

The mechanisms and technological issues of these surface processes are detailed and the properties of the metal surfaces are explained. The importance of the full processing procedure including cleaning, etching, surface conversion and final metal finishing is illustrated for industrial examples.

Contents

- Corrosion: Basic theory and electrochemical corrosion, Metallurgical cells, Environmental cells, Corrosive-mechanical interactions, Corrosion in some important environments, Materials selection, Cathodic and anodic protection, Corrosion inhibitors, Corrosion tests, Corrosion and design
- Thermal oxidation: Thermodynamics and kinetics, Oxidation control by alloying and coatings
- Surface technology: Objectives of surface treatments and introduction to surface related properties of metals and the concepts of the full surface processing, illustrated for industrial applications;
- Mechanisms, properties and applications for the following surface treatments are discussed, including technological and ecological issues:
 - o Electrochemical conversion: chromate conversion, zirconium-titanium conversion, phosphating;
 - o Chemical deposition/passivation: silane coatings, self-healing coatings, plasma coatings, including hybrid layers;
 - o Electrolytic conversion: anodising, electrolytic colouring;
 - o Metal deposition: electroplating (Cr, Sn, Ni, ...), (electroless) plating, galvanizing, aluminizing.

Initial competences

Basic knowledge of chemistry and physics

Final competences

- 1 Fundamental understanding of corrosion and corrosion control.
- 2 Insights in the enormous possible applications of surface techniques with special emphasis on their properties
- 3 To be able to make a justified material choice taking into account the environment in which the material is used and being able to interpret corrosion case studies.
- 4 Choosing the most appropriate surface treatment technique.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Excursion, Lecture, Practical

Study material

Type: Syllabus

Name: Environmentally assisted degradation - partim corrosion

Indicative price: € 10

Optional: no

Language : English

Available on Ufora : No

Online Available : No

Available in the Library : No
Available through Student Association : Yes

Type: Slides

Name: slides
Indicative price: Free or paid by faculty
Optional: no
Available on Ufora : Yes
Online Available : Yes
Available in the Library : No
Available through Student Association : No

References

- Corrosion Engineering Handbook, P.A. Schweitzer

Course content-related study coaching

Assessment moments

end-of-term assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Participation, Written assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Participation, Written assessment

Examination methods in case of permanent assessment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

During examination period: written closed-book exam (partly with oral explanation).

Calculation of the examination mark

At the start of the semester, several classes (e.g. practica, possible company visit) are labeled as classes with obligatory presence of the students. Per absence during an obligatory lecture, the student loses 1 point per absence of the obtained final score. Students who take this course as an elective course and who have classes of an obligatory course overlapping with these classes of this course are not obliged to attend these classes.

On the exam, the student is given 5 questions. 2 questions on the partim corrosion prepared written and explained orally, 2 questions around the partim surface treatments prepared written and explained orally and 1 exercise solved written.