SCUPI
Sichuan University - Pittsburgh Institute

Course Title: Technical Elective: Materials Corrosion and Protection

Course Syllabus Spring 2023

Course Description

Residents of industrialized nations live in metal-based societies. Whatever be metals end use, they tend to react with their environments to different extents and at different rates. Thus, corrosion is a natural phenomenon and is the destructive attack of a metal by its environment so as to cause a deterioration of the properties of the metals. This course emphasizes basic principles of corrosion science and engineering which underpin extensions to practice and provides a brief but rigorous introduction to corrosion science and engineering. The course is suitable for advanced undergraduate level for students that do not have backgrounds in electrochemistry but have taken introductory courses in materials science or physical chemistry. The course follows the approach of a physical chemist or materials scientist and is geared toward students of physical chemistry, materials science, and engineering. In addition, practicing corrosion engineers and materials engineers will find this course useful information that will broaden their understanding of the fundamental principles of corrosion science and engineering.

Course Syllabus

- Social aspects of corrosion and materials preservation
- Charged interfaces
- Electrochemical cells
- Thermodynamics of corrosion
- Corrosion kinetics and mixed potential theory
- Concentration polarization and diffusion
- Passivity
- Crevice corrosion and pitting
- Stress-corrosion cracking and corrosion fatigue
- Corrosion inhibitors
- Corrosion under organic coatings
- High temperature oxidation

Textbook + Lecture notes and handouts

Book: Introduction to Corrosion Science
Author: Edward McCafferty,
ISBN: 978-1-4419-0454-6, DOI: https://doi.org/10.1007/978-1-4419-0455-3
Publisher: Springer-Verlag,
2010.
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Grade

Homework (30%), class participation and activities (20%), Class Presentation (20%) and final examination (30%).