



AQUEOUS CORROSION AND ITS CONTROL

PROF. V.S. RAJA

Department of Metallurgical Engineering and Materials Science
IIT Bombay

INTENDED AUDIENCE : Metallurgical Engineering and Materials Science, but is open to other engineering branches

INDUSTRIES APPLICABLE TO : Oil and Gas Industries, Manufacturing

COURSE OUTLINE :

Corrosion failures of components cuts across all the industries and cost a national about 3.5% of its GDP. In addition, it affects environments, scant resources, safety and reliability of components. Effective control of corrosion requires basic understanding of electrochemical principles, metallurgical aspects and a clear perspective of the industrial problem. This course comprehensively addresses these aspects.

ABOUT INSTRUCTOR :

Taught several courses related to corrosion over the last 32 years. Published a book on Corrosion Failure Analysis: basics, Case Studies and Solutions Edited a book on Stress Corrosion Cracking: Theory and Practice. Passionate about teaching, recipient of the Prof. SP. Sukhatme award for excellence in teaching

COURSE PLAN :

Week 1: Introduction to the course and Importance of corrosion

Week 2: Can we predict of corrosion of a metal? Electrochemical Equilibrium and Thermodynamics of corrosion. Pourbaix diagrams and identification of stability regions

Week 3: Concepts of Electrochemical Kinetics, exchange current density charge transfer and diffusion controlled

Week 4: What determines the corrosion rates? Mixed Potential theory Passivity and Application of mixed potential theory for prediction of corrosion. Application of electrochemical kinetics for corrosion rate determination and mechanisms of corrosion

Week 5: Uniform corrosion and the factors affecting them and the control measures, concept of localized corrosion

Week 6: Galvanic Corrosion: Mechanism, factors affecting galvanic corrosion, prevention methods, typical industrial problems and methods of evaluation

Week 7: Crevice Corrosion: Mechanism, factors affecting crevice corrosion, prevention methods, typical industrial problems and methods of evaluation

Week 8: Pitting Corrosion: Mechanism, factors affecting pitting corrosion, prevention methods, typical industrial problems and methods of evaluation

Week 9: Intergranular Corrosion: Mechanism, factors affecting intergranular corrosion, weld decay, knife line attack. Role of welding techniques, parameters and other material conditions on weld decay.

Week 10: Industrial problems of weld decay, intergranular corrosion of other alloys, test methods and selection rationale.

Week 11: Dealloying: Mechanism, factors affecting alloying prevention methods, typical industrial problems. Flow assisted Corrosion, Erosion Corrosion, Cavitation damage: Mechanism, factors affecting these corrosion, prevention methods, typical industrial problems

Week 12: Environmentally assisted cracking: Stress corrosion cracking and Hydrogen Damage Mechanism, factors affecting cracking of metals, prevention methods, typical industrial problems and methods of evaluation

Week 13: Continuation of the above, Microbial Corrosion, Corrosion Control Philosophy and Management