

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)
DEPARTMENT OF CHEMISTRY

Open Elective: CORROSION SCIENCE AND IT'S APPLICATIONS

SYLLABUS FOR B.E. III-SEMESTER

L: T : P	Credits	CIE		SEE		Course Code
		Marks	Exam Duration	Marks	Exam Duration	
2:0:0	2	40	1.5H	60	3H	U21OE310CH

COURSE OBJECTIVES	COURSE OUTCOMES
The objectives of the course are	Upon the completion of this course students will be able to
1. To acquaint with the causes and factors influencing the rate of corrosion. 2. To understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact. 3. To familiarize with few preventive methods of corrosion. 4. To know various industrial methods like electroplating, electroless plating.	1. Explain different types of corrosion with suitable examples. 2. Discuss different factors that affect corrosion and passivation of metals. 3. Select a suitable metallic coating, organic coating and inhibitors for corrosion control of the equipment in a given application. 4. Discuss the principles and applications of cathodic protection and surface conversion coatings for corrosion control. 5. Apply the knowledge of various methods of corrosion control to suggest a solution for corrosion control of a given equipment in a given industrial application.

UNIT-I: CHEMICAL AND ELECTROCHEMICAL CORROSION

Introduction - gravity, cause, chemical and electrochemical corrosion, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion. Galvanic corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Differential aeration corrosion -pitting, waterline corrosion, crevice corrosion, stress corrosion and corrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential for iron(pourbaix diagram) and the polarization curve of iron.

Factors influencing corrosion

- a. Nature of metal: Relative position of metal in galvanic series, over voltage, relative areas of anode and cathode and nature of corrosion product.
- b. Nature of environment: Temperature, pH, humidity and dissolved oxygen.

UNIT-II: CORROSION CONTROL BY METALLIC COATINGS

Metallic coatings: Types - anodic and cathodic. Pre treatment of surface of base metal. Methods of application of metallic coatings: Hot dipping- galvanization - applications of galvanized RCC steel bars. Cladding, electro plating and electroless plating- Principle and their differences. Electroplating of Cu and Cr on Fe, electroless plating of Ni and Cu on insulators, Preparation of printed circuit board (PCB) by electrolessplating.

UNIT-III: CORROSION CONTROL BY ORGANIC COATINGS AND INHIBITORS

Organic Coatings: Paints – constituents and their functions. Vitreous enamel coatings. Varnishes. Super hydrophobic and self healing coatings. Epoxy coatings on RCC steel bars- impervious coatings.

Corrosion inhibitors: Anodic, cathodic and vapour phase inhibitors.

UNIT-IV: CORROSION CONTROL BY CATHODIC PROTECTION AND SURFACE MODIFICATION

Cathodic protection: Principle, sacrificial anodic protection (SAP), impressed current cathodic protection (ICCP). Application of cathodic protection for bridges, ship hulls and underground pipelines.

Surface conversion coatings: Carburizing, nitriding, cyaniding.

Books:

1. P.C.Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. S.S. Dara "A text book of engineering chemistry" S.Chand and Co.Ltd.,New Delhi (2006).
3. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, NewDelhi (2008).
4. Wiley Engineering chemistry, Wiley India pvt Ltd, II edition.
5. Chemistry in engineering and technology by J.C. Kuriacose and Rajaram.

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2/2/2020