SS837 INDUSTRIAL GALVANIZATION 3-1-0-4

Unit 1

Galvanic coatings

Hot dip galvanic coatings: Principle and process, Pretreatment methods – degreasing, pickling, fluxing, Bath modifications – addition of metals and composites. Alloy layer formation (Eta, Zeta, Delta, Gamma) and percentage composition of zinc and iron. Barrier protection. Cathodic protection. Advantages and disadvantages of galvanic coatings. Applications.

Unit 2

Corrosion and its control

Fundamentals of corrosion. Mechanism of corrosion. Types of corrosion, Cause of corrosion Area of corrosion, Corrosion due to utility. Methods of corrosion prevention: cathodic prevention, Anodic prevention, Addition of inhibitors, Protective coatings: Metallic, Organic and Inorganic coatings

Unit 3

Corrosion Kinetics

Faradays laws of electrolysis and its applications in determining corrosion rates, The laws, Corrosion kinetics, Mixed potential theory and its applications, Determination of corrosion by electrochemical measurements, Kinetics of passivity**.**

Unit 4

Selection of materials for corrosive environment

Types of Steel: Plain carbon steels, Alloy steels. Classification of Plain carbon steels: Low carbon steel, Medium carbon steel, High carbon steel - percentage weight of carbon and uses. Manufacturing of steel: Bessemer process, Open hearth process, Heat treatment of steel: Annealing, Quenching, Tempering, Casehardening, Flame hardening, Nitriding and Cyaniding, Design rules for corrosion prevention..

Unit 5

Material characterization methods

Microstructural characterization: Atomic absorption spectroscopic analysis (AAS), hollow cathode lamp, Electrochemicalcharacterization: OCP decay analysis, Self-corrosion rate determination,Polarization analysis and AC Impedence analysis. Advanced techniques used: Polarography: Principle of polarography, Dropping mercury electrode- Advantages and Disadvantages,Ilkovicequation,Residual curren. Principle and applications of potentiodynamic polarization. Electrochemical impedence analysis: principle, applications, Nyquist and Bode plots, Different circuit used in impedence analysis. Principle of cyclic voltametry. Linear sweep voltametry – linear potential wave form.

TEXT BOOKS/ REFERENCES:

1. Metallurgy and Applications - David Llewellyn, Roger Hudd; Butterworth-Heinemann Publishing
2. Electrochemical methods Fundamentals and applications – Allen J.Bard, LarryR.Faulkner; John Wiley and Sons;Inc.
3. Analytical Chemistry: Principles – John H. Kennedy; Saunders College Publishing
4. Nanotechnology Applications in coatings – Raymond H. Fernado, Li-Piin Sung; ACS
5. Introduction to materials chemistry – Harry. R. Allock: A John Wiley & sons, Inc; Publishing