

Epoxy Resins Technology Handbook (Synthesis, Epoxy Resin Adhesives, Epoxy Coatings) with Manufacturing Process and Machinery Equipment Details (3rd Edition)

Author:- Dr. Himadri Panda

Format: paperback

Code: NI346

Pages: 592

Price: Rs.2275US\$ 200

Publisher: NIIR PROJECT CONSULTANCY SERVICES

Usually ships within **5** days

Epoxy is a term used to denote both the basic components and the cured end products of epoxy resins, as well as a colloquial name for the epoxide functional group. Epoxy resin are a class of thermoset materials used extensively in structural and specialty composite applications because they offer a unique combination of properties that are unattainable with other thermoset resins.

Epoxyes are monomers or prepolymers that further reacts with curing agents to yield high performance thermosetting plastics. They have gained wide acceptance in protecting coatings, electrical and structural applications because of their exceptional combination of properties such as toughness, adhesion, chemical resistance and superior electrical properties. Epoxy resins are characterized by the presence of a three membered cycle ether group commonly referred to as an epoxy group 1, 2-epoxide, or oxirane. The most widely used epoxy resins are diglycidyl ethers of biphenyl-A derived from biphenyl-A and epichlorohydrin.

The market of epoxy resins are growing day by day. Today the total business of this product is more than 100 crores. Epoxy resins are used for about 75% of wind blades currently produced worldwide, while polyester resins account for the remaining 25%. A standard 1.5-MW (megawatt) wind turbine has approximately 10 tonnes of epoxy in its blades. Traditionally, the markets for epoxy resins have been driven by demand generated primarily in areas of adhesives, building and civil construction, electrical insulation, printed circuit boards, and protective coatings for consumer durables, amongst others.

The major contents of the book are synthesis and characteristics of epoxy resin, manufacture of epoxy resins, epoxide curing reactions, the dynamic mechanical properties of epoxy resins, physical and chemical properties of epoxy resins, epoxy resin adhesives, epoxy resin coatings, epoxy coating give into water, electrical and electronic applications, analysis of epoxides and epoxy resins and the toxicology of epoxy resins and photographs of machinery with suppliers contact details.

A total guide to manufacturing and entrepreneurial success in one of today's most epoxy resin industry. This book is one-stop guide to one of the fastest growing sectors of the epoxy resin industry, where opportunities abound for manufacturers, retailers, and entrepreneurs. This is the only complete handbook on the commercial production of epoxy resin product. It serves up a feast of how-to information, from concept to purchasing equipment.

1. Synthesis and Characteristics of Epoxy Resin

Introduction

Structure of Epoxides

Epoxidation of Unsaturated Hydrocarbons

Catalytic Oxidation of Ethylene and Higher Olefins

Epoxidation by Peroxy Acids and Their Esters

Preparation of Peroxy Acids

In Situ Epoxidation

The Epoxidation Mechanism

Unsaturated Materials

Epoxidation by Inorganic Peroxy Acids

Epoxidation with Aliphatic and Aromatic Hydrocarbon Hydroperoxides

Epoxidation with Chromic Acid and Chromyl Compounds

Biological Epoxidation

Dehydrohalogenation of Substituted Hydroxyl Compounds

The Epoxidation Mechanism

Halohydrin Formation

Epoxides from Epichlorohydrin

Glycidyl Ethers

Glycidyl Esters

Nitrogen-Containing Epoxides

Thioglycidyl Epoxides

Silicon-Containing Epoxides

Organophosphorus Epoxides

Halogen-Containing Epoxides

Epoxides from Hydroxy Sulfonates or Halogenated Acetates

Epoxides from Glycols

Epoxidation by Condensation

Darzens Glycidic Ester Condensations

Epoxides from Ylids

Epoxides from Halogenated Ketones and Nickel Carbonyl

Epoxides from the Reaction of Diazomethane with Aldehydes or Ketones

Epoxides Containing Unsaturation

Conclusions

2. Manufacture of Epoxy Resins

Raw Materials

Manufacture

Plant Location

Machinery Needed

Profit

3. Epoxide-Curing Reactions

The Effect of Epoxide Structure on Reactivity with Curing Agents

The Mechanism of the Curing Reaction

Polyaddition Reactions

Polyamines

Polyamides

Polyureas

Polyurethanes

Polyisocyanates

Polymercaptans

Polyhydric Alcohols

Polyphenols
Polycarboxylic Acids
Polybasic Acid Anhydrides
Silanes and Silanols
Others
Polymerization
Anionic Catalysts
Cationic Catalysts
4. The Dynamic Mechanical Properties of
Epoxy Resins
Basic Parameters
The Glassy Transition and Dynamic Mechanical Dispersion
Temperature and Frequency Interdependence
Experimental
Results and Discussion
Standard Measurements
Dynamic Measurements
Comparison of Results
Treatment by Reduced Variables
Conclusions
5. Physical and Chemical Properties of
Epoxy Resins
Solubility and Surface Properties
Network Structure and Physical Properties
Aging and Chemorheology
Bisphenol a Epoxy Homopolymers and Copolymers
Thermal Transition Effects
Dynamic Mechanical Response
Relaxation and Fracture Properties
Properties Compared with Elastomers and Thermoplastics
6. Epoxy Resin Adhesives
Introduction
Theories of Adhesion and Adhesive-joint Strength
Wetting and Spreading Phenomena
Boundary-Layer Theory
Surface-Attachment Theory of Adhesive-Joint Strengths
Stress Distribution in Adhesive Joints
Rheological Aspects of Adhesives
Unified Interpretation of Adhesive-Joint Strengths
Physical and Mechanical Aspects of Epoxy-Resin Adhesives
Dynamic Mechanical Techniques
Mechanical Behavior of Epoxy Adhesives During Joint Formation
Strength of Adhesive Materials
Chemical Aspects of Epoxy-based Adhesives
Curing Agents for Bisphenol A Epoxy Adhesives
Modifiers for Bisphenol A Epoxy Adhesives
Adhesives Based on Other Epoxy Materials
Technological Properties of Epoxy-adhesive Systems
Cure and Thermal Softening Behavior of Epoxy Adhesives
Stress and Environmental Durability of Adhesive Joints
Applications of Epoxy Adhesives
Future Prospects
7. Epoxy Resin Coatings

Classification of Epoxy-Resin Coatings
Epoxy Resins Commonly Used in Coatings
Epoxy-Resin Esters
Esters Produced from Solid Epoxy Resins
General Remarks
Formulation Latitude
Esters Produced from Liquid Epoxy Resins
Precatalyzed Liquid Epoxy Resin for the Production of Solid Epoxy Resins and Epoxy-Resin Esters
Cooking Procedure
“Two-Step” Liquid-Epoxy-Resin Route to Epoxy-Resin Esters
Cooking Procedure
Solid-Epoxy-Resin Solution Coatings
Cold-Cured Epoxy-Resin Systems
Polyamine Curing Agents
Polyamine-Adduct Curing Agents
Polyamide-Resin Curing Agents
Polyamide-Adduct Curing Agents
Tertiary Amine Curing Agents
Industrial Maintenance Coatings Based on Cold-Cured Epoxy-Resin Systems
High-Film-Build Cold-Cured Epoxy-Resin Coatings
Application Instructions
Manufacturing Instructions
Epoxy Baking Finishes
Epoxy-Phenolic Coating Systems
Epoxy-Urea-Formaldehyde Resin Coating Systems
Epoxy-Thermosetting Acrylic Coating Systems
Liquid Epoxy Resins in Solventless and Super-High-Solids Systems
Special Application Equipment and Formulation for Solventless Systems
Manufacturing Instructions
Application
Ketimine Curing Agents
Manufacturing Instructions
Application
Curing Characteristics
Powder Coatings
Application Equipment
Epoxy-Resin Powder-Coating Formulations
Fusion-Produced Epoxy-Resin Powders
Manufacturing Instructions
Applications Instructions
Dry-blended Epoxy-Resin Powders
Manufacturing Instructions
Application Instructions
Properties and Applications
Thermoplastic Epoxy Resins
Zinc-Rich and General Purpose Shop Primers
Manufacturing Instructions
Application Instructions
Manufacturing Instructions
Application Instructions
Thermoplastic-Epoxy-Resin Crosslinked Systems
Water-Reducible Epoxy Resin Coatings

Water-Reducible Epoxy-Ester Baking Finishes
Manufacturing Instructions
Application Instructions
Water-Reducible Polyamide-Cured Epoxy-Resin Coatings
Manufacturing Instructions
Manufacturing Instructions
Water-Reducible Epoxy-Resin Coatings for Electrodeposition
General Remarks
Maleinization Step After Complete Esterification of the Epoxy Resin with Organic Acids
Cooking Procedure
Application Instructions
8. Epoxy Coating Give into Water
9. Electrical and Electronic Applications :
Sealants and Foams
Electronic and Electrical Applications
Introduction
Casting
Potting
Encapsulation
Coatings
Sealing
Molding
Formulation of the Resin System
Internal Stresses
Rapid Cures
Flexibilizing Epoxy Resins
Fillers
Reactive Diluents
Cycloaliphatic Epoxides
High-Temperature Epoxy-Resin Systems
Flame-Retardant Epoxy Resins
Colorless Epoxy Resins
Epoxy Formulations
Molding
Molding Compounds
Molding Technology
Liquid-Injection Molding
Pellets and Preforms
Epoxy Sealants
Epoxy Foams
Gas-Blown Foams
Syntactic Foams
One-Package Foams
Epoxy-Foam Applications
Epoxy Strippers
Handling of Epoxy Casting Systems
10. Analysis of Epoxides and Epoxy Resins
Uncured Epoxy Resins
Qualitative Tests
Detection of Free Epoxy Groups
Determination of Epoxy Group—Lithium-Chloride Test
Reagents
Procedure

Determination of Epoxy Group—Periodic Acid Test

Reagents

Procedure

Determination of Epoxy Group—Pyrolysis Test

Reagents

Procedure

Determination of Epoxy Group—Lepidine Test

Reagents

Procedure

Detection of the Bisphenol A Skeleton

Determination of Bisphenol A Epoxy Resins—Mercuric Oxide and Nitric Acid Tests

Reagents

Procedure

Determination of Bisphenol A Epoxy Resins in Coatings—Nitric Acid Test Reagents

Reagent

Procedure

Determination of Bisphenol A Epoxy Resins—Filter-Paper Test

Reagents

Procedure

Determination of Bisphenol A Epoxy Resin—Formaldehyde Test

Reagents

Procedure

Determination of Bisphenol A Epoxy Resins—Phenylenediamine Test

Reagent

Procedure

Detection of Epoxy Resins Based on 4,4'-Diamino-diphenylmethane

Determination of Epoxy Resins Based on 4,4'-Diaminodiphenylmethane

Reagents

Procedure

Detection of Other Epoxy Resins

Quantitative Tests of the Epoxy Group

Hydrohalogenation Methods

Estimation of Epoxy Group—Hydrochloric Acid in Dioxane, Methyl Ethyl Ketone, or Dimethylformamide

Reagents

Procedure

Calculations

Estimation of the Epoxy Group—Pyridinium Chloride in Pyridine

Reagents

Procedure

Hydrohalogenation by Direct Titration

Estimation of Epoxy Group

Reagents

Procedure

Calculations

Other Chemical Methods

Estimation of Other Functional Groups

Hydroxyl Group

β-Glycol Group

Estimation of α-Glycol Group

Reagents

Procedure

Calculation

Chlorine
Esterification Equivalent Weight
Estimation of Esterification Equivalent Weight
Reagents
Procedure
Calculation
Infrared Spectroscopy
Technique
Epoxide Absorption Bands
Epoxy Resins
Quantitative Estimation
Following the Degree of Cure
Other Physical Methods
Ultraviolet Spectroscopy
Electron Spin and Nuclear Magnetic Resonance Methods
Gas Chromatography
Paper Chromatography
Thin-Layer and Gel-Permeation Chromatography
Handling Properties
Molecular Weight
Softening Point
Viscosity
Color
Blends and Compounds
Hardeners and Accelerators
Organic Acid Anhydrides
Determination of Acid and Anhydride Content
Reagents
Procedure
Calculations
Amines
Determination of Amine Number
Reagents
Procedure
Calculation
The Curing Process
Curing Characteristics of Epoxy Resin-Hardener Systems
Determining the Degree of Cure
Analysis of Cured Epoxy Resins
11. The Toxicology of Epoxy Resins
Introduction
Experimental Method
Materials
Acute Toxicity
Chronic Toxicity
Irritation
Sensitization
Results
Acute Toxicity
Chronic Toxicity
Irritation
Sensitization
Medical Experience with Epoxy Resins

Comment

12. BIS Specifications

13. International Standards (ISO)

14. Plant Layout and Process Flow Chart & Diagram

15. Photographs of Machinery with Supplier's

Contact Details

About NIIR

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

Our Detailed Project report aims at providing all the critical data required by any entrepreneur vying to venture into Project. While expanding a current business or while venturing into new business, entrepreneurs are often faced with the dilemma of zeroing in on a suitable product/line.

NIIR PROJECT CONSULTANCY SERVICES, 106-E, Kamla Nagar, New Delhi-110007, India.
Email: npcs.india@gmail.com Website: NIIR.org

Sat, 17 May 2025 07:11:24 +0000