Phenolic resins are obtained by the reaction of phenols with aldehydes. The simplest representative of these types of compounds, phenol and formaldehyde, are by far most important. Phenolic resins are mainly used in the production of circuit boards. The development of synthetic resins for surface coating applications has usually followed the use of similar material in the plastic industry. One of the first synthetic resins ever used commercially, both in plastics and in surface coatings was the phenolic resin. Phenolic resins result aldehyde with or without modification. Phenol resin bonded wood materials; particle boards (PB), plywood, fiber board (FB) and glued wood construction element are used for outdoor construction and in high humidity areas because of the high water and weathering resistance of the phenolic adhesive bond and high specific strength. The competitiveness and development of the wood working industry are of utmost importance for the development for thermosetting plastics. This industry is the largest consumer of urea melamine and phenol resins. Phenolic laminates are made by impregnating one or more layers of a base material such as paper, fiberglass or cotton with phenolic resin and laminating the resin saturated base material under heat and pressure. The resin fully polymerizes (cures) during this process. The base material choice depends on the intended application of the finished product. Paper phenolics are used in manufacturing electrical components such as punch through boards and household laminates. Glass phenolics are particularly well suited for use in the high speed bearing market. Other applications of phenolic resins are in chemical equipments, fibers, socket putties, photo resists, tannins, brush putties, etc. Good performance at a reasonable cost has long been an important selling point for phenolic resins, especially in applications such as wood bonding and insulation, where discoloring and other drawbacks can be overlooked because of cost savings. Hence demand of phenolic resins is growing rapidly.

This book basically deals with general reaction of phenols with aldehydes, the resoles, curing stages of resoles, kinetics of a stage reaction, chemistry of curing reactions, kinetics of the curing reaction, the novolacs, decomposition products of resites, acid cured resites, composition of technical resites, mechanisms of rubber vulcanization with phenolic resins, thermosetting alloy adhesives, vinyl phenolic structural adhesives, nitrile phenolic structural adhesives, phenolic resins in contact adhesives, chloroprene phenolic contact adhesives, nitrile phenolic contact adhesives, phenolic resins in pressure sensitive adhesives, rubber reinforcing resins, resorcinol formaldehyde latex systems etc.

The present book covers manufacturing processes of phenolic resins. New entrepreneurs, technocrats, research scholars can get good knowledge from this book.
1. HISTORICAL DEVELOPMENT OF PHENOLIC RESINS
2. RAW MATERIALS
   Phenols, Physical Properties of Phenol, Cumene Process (Hock Process), Cresols and Xylenols
   Synthesis Methods, Alkylphenols, Phenols from Coal and Petroleum, Other Phenolic Compounds,
   Resorcinol, Bisphenol-A, Formaldehyde, Properties and Processing, Paraformaldehyde, Trioxane and Cyclic
   Formals, Hexamethylenetetramine, HMTA, Furfural, Other Aldehydes
3. CHEMICAL STRUCTURE
   General Reaction of Phenols with Aldehydes, The Resoles, Curing Stages of Resoles, Kinetics of A-Stage
   Reaction, Chemistry of Curing Reactions, Kinetics of the Curing Reaction, The Novolacs, Decomposition
   Products of Resites, Acid-Cured Resites, Composition of Technical Resites
4. PHENOLIC RESINS FROM HIGHER
   ALDEHYDES
   Acetaldehyde, Butyraldehyde, Chloral, Furfural, Acrolein
5. PHENOLIC RESINS FROM POLYHYDRIC
   PHENOLS
6. REACTION MECHANISMS
   Molecular Structure and Reactivity of Phenols, Formaldehyde-Water and
   Formaldehyde-Alcohol Equilibria, Phenol-Formaldehyde Reaction under Alkaline Conditions, Inorganic
   Catalysts and Tertiary Amines, Ammonia, HMTA and Amine-Catalyzed Reactions, Reaction Kinetics of the
   Base-Catalyzed Hydroxymethylation, Prepolymer Formation, Resole Cross-Linking Reactions. Quinone
   Methides, Acid Curing, Heat Curing, Phenol-Formaldehyde Reactions under Acidic Conditions, Reaction
   Kinetics in Acidic Medium, Reaction under Weak Acidic Conditions. â€œHigh-Orthoâ€•Novolak Resins,
   Novolak Cross-Linking Reaction with HMTA, Reaction with Epoxide Resins, Reactions with Diisocyanates
7. THE PHYSICAL STRUCTURE OF PHENOLIC
   RESINS
   Introduction, X-Ray Examination, Electron Microscope Examination, The Isogel Theory of Phenoplast
   Structure, The Spherocolloid Theory of Phenoplast Structure, Further Swelling Experiments, Development of
   Structure in A-Stage Resin, General Picture of Phenoplast Structure, Structure of Cast Phenoplasts
8. RESIN PRODUCTION
9. FILLERS FOR PHENOLIC RESIN MOULDING
   POWDERS
   Types of Filler, Effect of Filler on Impact Strength and Damping, Microscopic Structure of Fillers, Ratio of
   Resin to Filler, Standard Classification of Phenoplast Molding Powder According to Filler, Properties of
   Individual Fillers, Cellulose Derivatives, Wood Flour, Walnut-Shell Flour, Cottonseed Hulls, Cellulosic Fibers,
   Textile By-Products, Proteinaceous Fillers, Carbon Fillers, Mineral Fillers
10. FILLERS AND RESINS FOR LAMINATES
    Classification of Laminates, Laminated Phenolic Sheets, Laminated Phenolic Tubes (NEMA Classi-fication),
    High Strength Paper Laminates, Plastic Bonded Cotton Fiber, Glass Fabric Filler, Resins used for Laminates
11 PHYSIOLOGY AND ENVIRONMENTAL
    PROTECTION
    Toxicology of Phenols, Toxicology of Formaldehyde, Environmental Protection, Waste Water and Exhaust
    Air Treatment Processes, Microbial Transformation and Degradation, Chemical Oxidation and Resinification
    Reactions, Thermal and Catalytic Incineration, Extraction Processes and Recovering, Activated Carbon
    Process, Gas Scrubbing Processes
12. DEGRADATION OF PHENOLIC RESINS BY
    HEAT, OXYGEN AND HIGH ENERGY
    RADIATION
    Thermal Degradation, Oxidation Reactions, Degradation by High Energy Radiation
13. MECHANICAL PROPERTIES OF MOLDED
    PHENOLIC RESINS

14. MECHANICAL PROPERTIES OF LAMINATED PHENOLIC RESINS


15. MODIFIED AND THERMAL-RESISTANT RESINS

Etherification Reactions, Esterification Reaction, Boron-Modified Resins, Silicon-Modified Resins, Phosphorus-Modified Resins, Heavy Metal-Modified Resins, Nitrogen-Modified Resins, Sulfur-Modified Resins

16. COMPOSITE WOOD MATERIALS


17. MOULDING COMPOUNDS

Standardization and Minimum Properties, Composition of Molding Powders, Resins, Fillers, Reinforcements and Additives, Wood Flour and Cellulose Fibers, Asbestos, Mineral Flour, Other Fillers and Fibers, Colorants, Lubricants and Release Agents, Production of Molding Powders, Thermoset Flow, Manufacturing of Molded Parts, Compression Molding, Transfer Molding, Injection Molding, Selected Properties, Thermal Resistance, Shrinkage and Post-Mold Shrinkage, Thermal Expansion

18. HEAT AND SOUND INSULATION MATERIALS


19. THERMAL PROPERTIES OF PHENOLIC RESINS

Introduction, Coefficient of Expansion, Flame Resistance

20. CHEMICAL RESISTANCE OF PHENOLIC RESINS

Introduction, Water Absorption, Effect of Reagents, Chemical Applications for Phenoplasts, Resistance to Microorganisms

21. OIL SOLUBLE PHENOLIC RESINS

Introduction, Pure Oil-Soluble Phenoplasts, The Modified Phenoplasts, Reactions of the Phenoplasts with Oils

22. FRICTION MATERIALS


23. PHENOLIC RESINS IN RUBBERS AND ADHESIVES

24. PHENOLIC ANTIOXIDANTS

25. OTHER APPLICATIONS
Carbon and Graphite Materials, Phenolics for Chemical Equipment, Phenolic Resin/Fiber Composites, Phenolic Resin Fibers, Blast Furnace Taphole Mixes, Photo-Resists, Socket Putties, Brush Putties, Tannins, Ion-Exchange-Resins, Casting Resins

26. TECHNICAL MANUFACTURE OF PHENOLIC RESINS
Resin Manufacture, Cast Resins, Resin Varnishes, Resin Compound, Molding Powder, Phenoplast Molding Laminates

27. MOULDING TECHNIQUE FOR PHENOLIC RESINS
Introduction, Compression Molding, Transfer Molding, Injection Molding, Molding Practice, Preheating

28. MISCELLANEOUS TECHNICAL APPLICATIONS OF PHENOLIC RESINS

29. FOUNDRY RESINS

30. INDUSTRIAL LAMINATES AND PAPER IMPREGNATION
Electrical Laminates, Materials, Paper, Resins, Production of Electrical Laminates, Laminated Tubes and Rods, Cotton Fabric Reinforced Laminates, Decorative Laminates, Filters, Battery Separators

31. COATINGS
Automotive Coatings, Water-Borne Paints and Electrodeposition, Coatings for Metal Containers, Marine Paints, Shop Primers, Wash Primers, Oil-Modified Phenolic Resin Paints, Printing Inks, Rosin-Modified Phenolic Resins, Other Applications

32. ABRASIVE MATERIALS

33. ELECTRICAL PROPERTIES OF PHENOLIC RESINS

34. ANALYTICAL METHODS
Monomers, Nitrogen and Water, Physical Properties, Reactivity, Chromatographic Methods, Spectroscopy

35. PHENOLIC RESINS AS ION-EXCHANGE RESINS
About NIIR

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