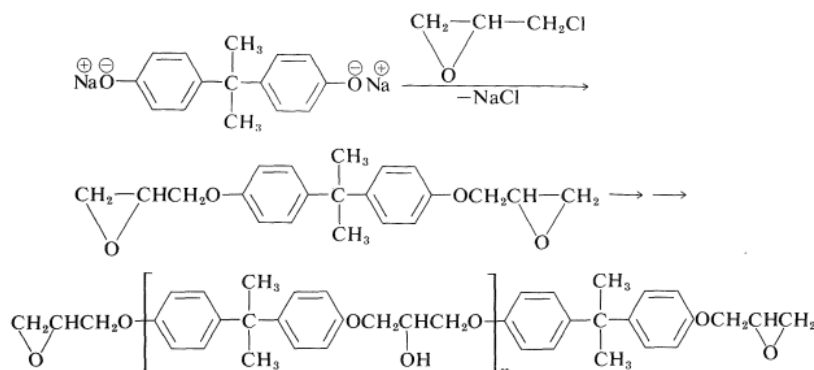


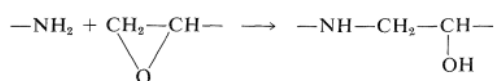
15.11: EPOXY RESINS - THE ADVENT OF MODERN GLUES

A very useful group of adhesives and plastics is based on condensation polymers of bisphenol A and chloromethyloxacyclopropane (epichlorohydrin). The first step in the formation of epoxy resins is to form a prepolymer by condensation polymerization of the sodium salt of bisphenol A with the epoxide:



The formation of a prepolymer involves two different kinds of reactions. One is an $\text{S}_{\text{N}}2$ -type displacement, and the other is oxide-ring opening of the product by attack of more bisphenol A. Usually, for practical purposes the degree of polymerization n of the prepolymer is small (5 to 12 units).

The epoxy prepolymer can be cured, that is, converted to a three-dimensional network, in several different ways. A trifunctional amine, such as $\text{NH}_2\text{CH}_2\text{CH}_2\text{NHCH}_2\text{CH}_2\text{NH}_2$, can be mixed in and will extend the chain of the polymer and form cross-links by reacting with the oxide rings:



Alternatively, a polybasic acid anhydride can be used to link the chains through combination with secondary alcohol functions and then the oxide rings.

CONTRIBUTORS AND ATTRIBUTIONS

- John D. Robert and Marjorie C. Caserio (1977) *Basic Principles of Organic Chemistry, second edition*. W. A. Benjamin, Inc. , Menlo Park, CA. ISBN 0-8053-8329-8. This content is copyrighted under the following conditions, "You are granted permission for individual, educational, research and non-commercial reproduction, distribution, display and performance of this work in any format."

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