

Exp. No. (5)

Preparation of Urea-Formaldehyde Resins

Introduction

Urea-formaldehyde resins is prepared by step-growth polymerization (condensation polymerization).

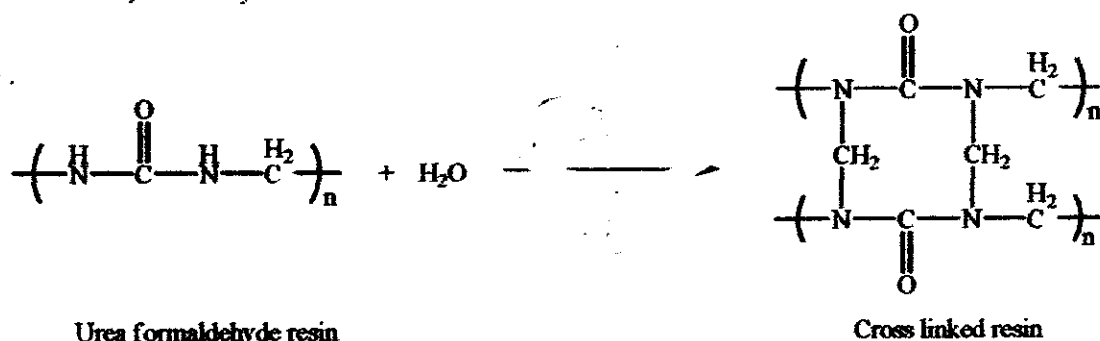
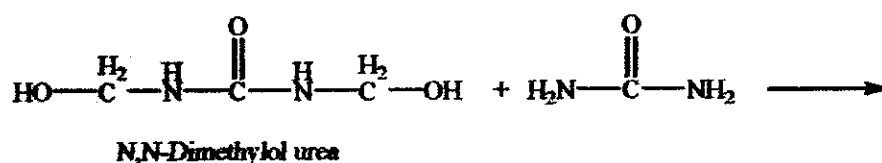
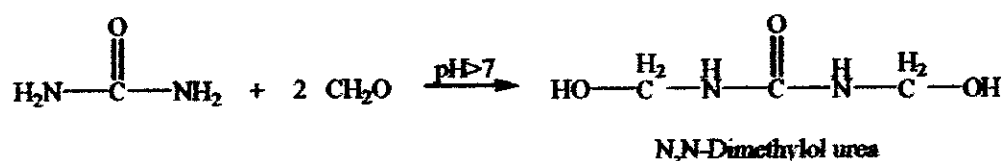
The resin is used as adhesive for the bounding of plywood and other structure wood products, because urea formaldehyde resins are lighter in color than phenol formaldehyde resins, they are used for interior plywood and decorative paneling.

The reaction between urea and formaldehyde involved two steps,

The first step is the addition of formaldehyde to urea to form methylolated urea, the second step is the condensation between methylol and amino group to form methylene-linked polymers or between two methylol groups to form cross-linked polymers.

As in phenolic resins, the formation of urea formaldehyde resins is known to be greatly influenced by both acid and base catalysts.

The condensation of methylol unites to yields polymer is shown in the following reaction:



Apparatus

1. Beaker
2. Round bottom flask
3. Condenser
4. Buckner funnel
5. Water bath
6. Thermometer

Reagent and materials

1. Urea
2. Formaldehyde
3. NaOH (dilute)
4. HCl (dilute)
5. Filter paper
6. Litmus paper

Procedure

1. **Weight 3.5g** of urea and crushed it in dry beaker.
2. **Add 10ml** of formaldehyde solution and stirr until solid urea is dissolve.
3. **Few drops (4-5 drops)** of sodium hydroxide solution is added for solution medium to become basic, use litmus paper as indicator.
4. **Pour the mixture** into dry and weight round bottom flask with coke fit condenser.
5. **Heat the mixture** in water bath for 1 hour at 70-80°C use thermometer to keep the temperature constant.
6. **Cool the mixture** and add few drops (4-5 drops) of dilute hydrochloric acid to neutralize the mixture (pH = 6-7). Use litmus paper as indicator.
7. **Filter the solution** using Buckner funnel. Dry the product and weight it for yield percentage.