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Study of the Condensation Reaction of Amines Different Environment

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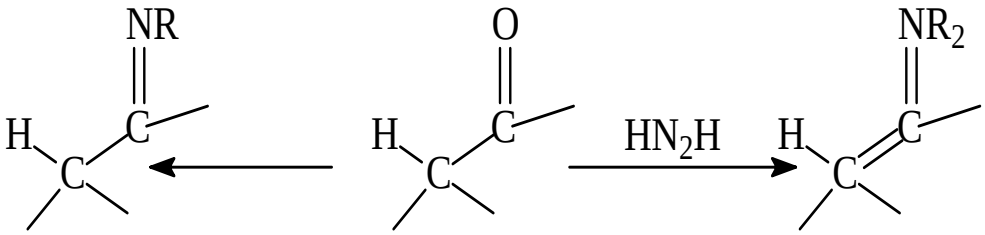
Abstract: The condensation reaction of urea with formaldehyde in the presence of sodium bisulfite in a weakly alkaline medium was studied: in the first stage, regardless of the reaction conditions of urea with formaldehyde, the reaction product is oxymethylol derivatives.

Keywords: condensation, urea, formaldehyde, sodium bisulfite, slightly alkaline medium, interactions, Schiff bases, unsaturated amine, neutral, slightly alkaline solution.

INTRODUCTION

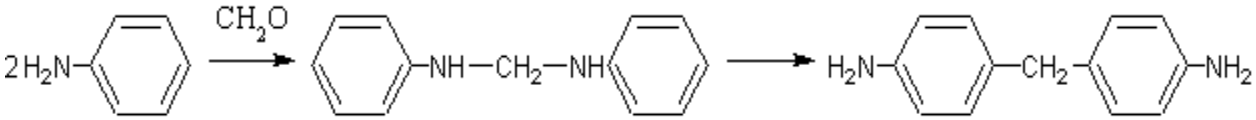
The reactions of aldehydes with primary and secondary amines are a classic example of nucleophilic addition at the carbonyl group [1]. The final reaction products in the case of primary amines are imines (Schiff bases), and for secondary amines, enamines (unsaturated amine). If we proceed only from the structure of the products, these reactions should be considered completely different, since in imines the double the bond binds nitrogen and carbon, and enamines have two carbon atoms:



The condensation reaction of urea with formaldehyde in the presence of sodium bisulfite in a slightly alkaline medium: in the first stage, regardless of the conditions of the reaction of urea with formaldehyde, the reaction product is oxymethylol derivatives [2-8].

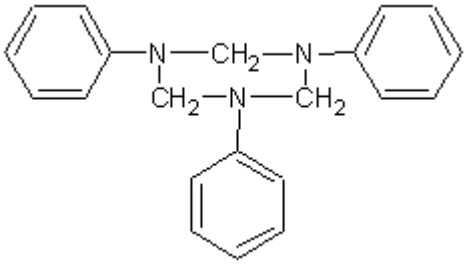
METHODS AND RESULTS

Some reactions of aromatic amines with aldehydes or ketones, which belong to the classical reactions of organic chemistry, are important for the preparation of polymer compounds. Of particular interest is the polycondensation of aniline with formaldehyde. If these components are condensed in a molar ratio of 2:1 in the presence of alkali, predominantly di-(phenylamino)-methane is formed, which, when heated with aniline hydrochloride, rearranges into diaminodiphenylmethane with partial resinification:

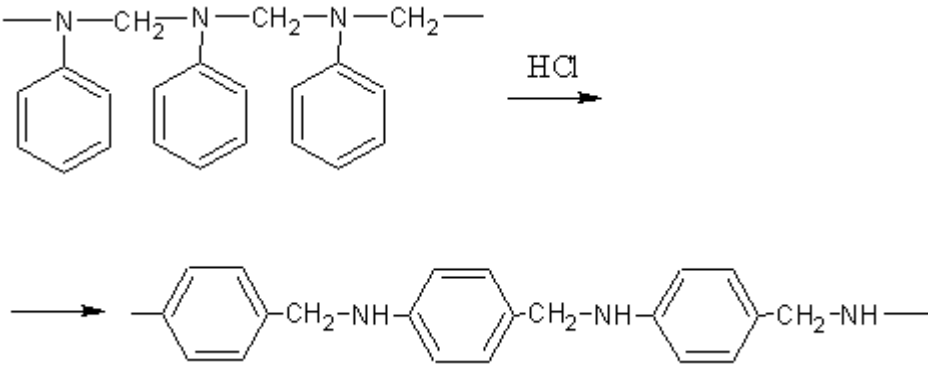


In a neutral or slightly alkaline solution at an equimolecular ratio. The components are formed polymers of anpidroformaldehydeaniline $C_6H_5N = CH_2$. A Trimer

(T= 140°C) was isolated, which has a cyclic structure.



Under the influence of acids, the polymers of an hydroformaldehydeaniline are rearranged into polymeric n-benzylamine:



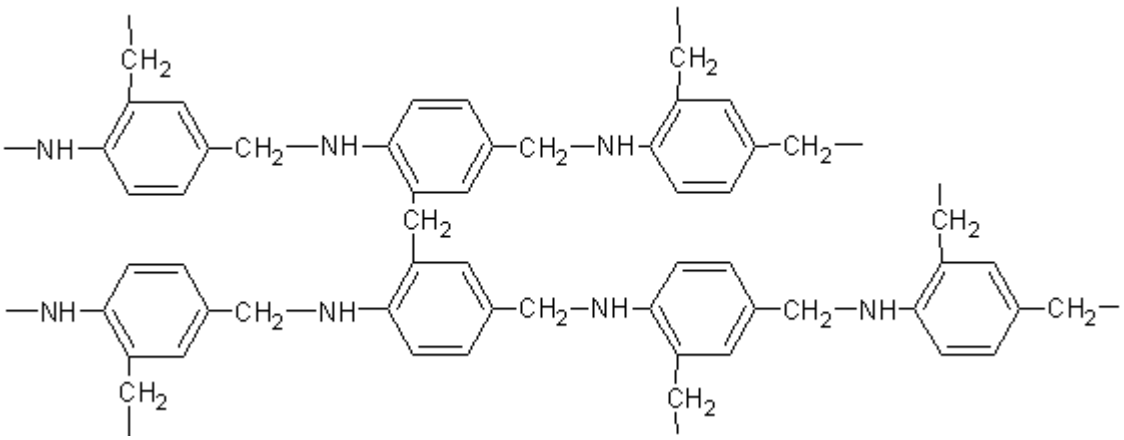
CONCLUSION

Therefore, upon rearrangement, the aromatic nucleus enters the polymer chain. This is proved by the fact that when the polymeric anpidroformaldehydeaniline is cleaved, N-methylaniline is formed, and when the rearrangement product is cleaved, n-toluidine is obtained.

Chains of the type of polymers of p-benzylamine are also formed directly during the polycondensation of aniline with formaldehyde in an acidic medium, and the course of the process depends on the amount of acid.

When the molar ratio of aniline and formaldehyde exceeds 1:1, a polymer is formed that undergoes transformations similar to the transition of novolac to resitol and resit under the influence of curing agents.

Compounds of the n-benzylamine type with an excess of CH_2O form macromolecules of a three-dimensional structure, and methylene bridges appear mainly in the ortho-position according to the scheme:



Other aldehydes (acetaldehyde, butyric aldehyde, etc.) are also used for condensation with aniline. Interaction with butyric aldehyde at any ratio of aniline and aldehyde leads to the formation of liquid polymers with a molecular weight of 300-400.

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