

## UNITED STATES PATENT OFFICE

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REACTION PRODUCT OF NAPHTHYLAMINE  
AND ALDONIC ACIDS

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1

This invention relates to new and useful organic compounds, and more particularly reaction products of aldonic acids and amines and a method for the preparation thereof.

One of the objects of the invention is to produce complex organic compounds which are soluble in alkaline solutions.

Another object of the invention is to produce new and useful reaction products of amines and aldonic acids.

A more specific object of the invention is the preparation of new and improved reaction products of aromatic amines and gluconic acid.

Another specific object of the invention is the preparation of naphthylamine gluconates.

Another object of the invention is the provision of a new and improved method for preparing compounds of the type referred to above. Other objects will appear hereinafter.

In accordance with the invention, it has been found that new and useful products are obtained by reacting aldonic acids with amines, preferably aromatic amines, and particularly naphthylamines. The preferred products are alkali-soluble and are especially suitable for use in electroplating baths, that is, baths for the electrodeposition of metals, as, for example, zinc and cadmium. Our co-pending application Serial No. 546,439, filed of even date herewith, describes alkaline cyanide cadmium plating baths containing products prepared in accordance with the present invention. It will be understood, however, that the products may be employed for many other purposes.

The invention will be further illustrated, but is not limited, by the following example in which the quantities are stated in parts by weight unless otherwise indicated:

*Example*

A mixture was prepared by mixing together

	Parts
Alpha naphthylamine -----	20
and	
50% gluconic acid -----	120

The mixture was refluxed for two hours and thereafter cooled. The resultant reaction product solidified on cooling.

When small amounts of this product were added to a cadmium plating bath in proportions within the range of 0.25 gram to 1 gram per gallon of bath, a considerable increase in brightness of the electrodeposited cadmium was noted. Furthermore, it was observed that this brightening effect could be obtained at current densities

2

up to about 40 amperes per square foot without burning the electrodeposited metal. The alpha naphthylamine gluconate was soluble in the plating bath and did not tend to coagulate, decompose or otherwise deteriorate during the plating operation. Good results were also obtained when this product was incorporated with electrolytes used in barrel plating operations.

Other reaction products of amines with aldonic acids may be prepared by substituting other amines for the alpha naphthylamine in the foregoing example, and by substituting other aldonic acids for the gluconic acid. As examples of amines there may be mentioned other aromatic amines including beta naphthylamine and the various naphthalene di-amines.

Examples of other suitable aldonic acids, in addition to gluconic acid, are mannonic, galactonic, and arabonic acids. The aldonic acids are derived from aldoses by oxidation.

The products of the invention may be used as such, or they may be incorporated in organic solvents, as for example, monobutyl Carbitol, methyl "Cellosolve" Formal, and other similar water miscible organic solvents.

In general, it is preferable to employ approximately equi-molecular proportions of aldonic acid and amine, or approximately 1 mole of aldonic acid for each primary or secondary amino group present in the amine. If desired, an excess of the aldonic acid may be employed.

The temperature of reaction will vary with different types of amines, but good results have been obtained by employing temperatures at which concentrated aqueous solutions of the aldonic acid will reflux. Aldonic acids, such as gluconic acid, are not obtained ordinarily in pure form but are usually prepared commercially as aqueous solutions containing around 50% of the acid, the concentration depending upon the maximum solubility of the aldonic acid in water.

All of the aldonic acids exist in alpha and beta lactone forms. Gluconic acid is preferred for the practice of this invention because it is more cheaply and readily available than the other aldonic acids.

The invention is hereby claimed as follows:

1. The product of the reaction of approximately equimolecular proportions of alpha naphthylamine and an aqueous solution of an aldonic acid under refluxing conditions, which product upon cooling is a solid.

2. The product of the reaction of alpha naphthylamine and an aqueous solution of gluconic acid under reflux conditions, the quantity of



3

gluconic acid corresponding to at least one mol per mol of alpha naphthylamine and the resultant product on cooling being a solid.

3. A method of preparing new and useful chemical substances which comprises reacting together an aldonic acid and a naphthylamine containing at least one amino group selected from the class consisting of primary and secondary amino groups under the influence of heat, the quantity of the aldonic acid corresponding to at least one mol for each of said primary and secondary amino groups in said naphthylamine.

4. A method of preparing new and useful chemical substances which comprises reacting together an aldonic acid and alpha naphthylamine containing at least one amino group selected from the class consisting of primary and secondary amino groups under the influence of heat, the quantity of the aldonic acid corresponding to at least one mol for each of said primary and secondary amino groups in said naphthylamine.

5. A process of preparing new and useful substances which comprises refluxing alpha naphthylamine with an aqueous solution of gluconic acid containing approximately 50% gluconic acid, the quantities of alpha naphthylamine and gluconic acid being approximately equi-molecular, and the resultant product on cooling being a solid.

6. The product of the reaction of alpha naphthylamine with gluconic acid in the presence of water under refluxing conditions, the quantities of alpha naphthylamine and gluconic acid being approximately equi-molecular quantities, and the resultant product on cooling being a solid.

7. A process of preparing reaction products of alpha naphthylamine and gluconic acid which comprises refluxing an aqueous solution of gluconic acid with alpha naphthylamine for ap-

4

proximately 2 hours, the quantities of alpha naphthylamine and gluconic acid being approximately equi-molecular quantities, and the resultant product on cooling being a solid.

8. The product of the reaction of a naphthylamine containing amino groups from the class consisting of primary and secondary amino groups and an aldonic acid in the presence of water under the influence of heat, the quantity of the aldonic acid corresponding to at least one mol for each of said amino groups in said naphthylamine, and the said product on cooling being a solid.

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