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PRODUCTION OF DYEINGS AND PRINTS ON TEXTILE MATERIAL

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It is known that dyeings produced with tetrasulphuric acid ester salts of the tetrahydro-1:2-2':1'-dianthraquinoneazine group (Indanthrene Blue), which salts are obtainable for example as described in German specifications Nos. 470,809, 580,013, 580,534, 584,718 and U. S. Patent 1,999,477, are extraordinarily sensitive to oxidizing agents. In developing such dyeings by means of acid oxidation, the dyestuff easily becomes too much oxidized whereby that azine is formed which is of duller greener tint as compared with the bright blue tint of the N-dihydro-1:2-2':1'-dianthraquinoneazine and is therefore tinctorially valueless.

This disadvantage is particularly noticeable when the so-called steaming processes are used for the development in which the ester salt together with a suitable oxidizing agent, for instance sodium chlorate and an agent which yields acid under action of heat, for instance ammonium sulphocyanide or diethyltartrate is printed on the material and the colour after-developed by steaming (see German specification No. 433,146 and U. S. Patent 1,747,107).

In the U. S. Patent No. 1,779,305 the use of oxidizable so-called buffer substances is recommended; these allow the normal development of the dyeing but are more easily oxidizable than is the vat dyestuff developed so that any excess of oxidizing agent is taken up and the dyeing protected from over-oxidation. This process yields in very many cases good and useful results. In the case of tetrasulphuric acid esters of the tetrahydro-1:2-2':1'-dianthraquinoneazine group, the process of U. S. Patent 1,779,305 is not unconditionally permissible. In spite of the use of large proportions of such buffer substances over-oxidation may occur.

In this connection attention must be called also to the process of German specification No. 591,410. In that specification the tint is developed from the tetrasulphuric acid ester without regard to over-oxidation and then the over-oxidized tint is reduced to the normal shade by treatment with a reducing agent. This process however necessitates a further operation.

The present invention relates to a process in which a normal reliable development of the aforesaid tetrasulphuric acid ester salts is obtained by a short steaming owing to the presence in the printing paste of ammonium nitrate in addition to sodium chlorate. Ammonium nitrate acts in this case no doubt as an acid splitting agent, as an oxidizing agent and as a buffer substance. The certainty of the process which constitutes the technical advance as compared with the known art is exhibited when the material has to be set aside for some time after the printing and before the steaming. Well developed normal tints are obtained by the process of the invention, while for example in using ammonium sulphocyanide instead of ammonium nitrate greenish dull tints are obtained.

It is to be mentioned that oxidizing catalysts, as for instance, vanadate of ammonia, which are necessary in the steam developing processes hitherto known (see U. S. Patent No. 1,779,305) are generally not needed in the present process.

The present invention is illustrated by the following examples.

Examples I and II

For printing the following pastes can be used:

Examples of printing paste	*I*	*II*
Sodium salt of the tetrasulphuric acid ester of tetrahydro-1:2-2':1'-dianthraquinoneazine (20 per cent strength)	*Parts* 100	*Parts* 100
Urea	80	30
Sodium salt of dimethylaniline-parasulphonic acid		30
Water	90	200
Starch tragacanth thickening, neutral	570	500
Ammonium nitrate solution (1:2)	90	90
Sodium chlorate solution (1:3)	60	60
Ammonia solution (25 per cent strength)	10	20
	1000	1000

The above printing pastes are printed on cotton and the goods are steamed for 2–8 minutes, washed, soaped and rinsed. In this manner the tints are developed with certainty and simplicity. Normal tints of N-dihydro-1:2-2':1'-dianthraquinoneazine (Indanthrene) are obtained.

Example III

Cotton is padded with a padding liquor, composed of—

	Parts
Sodium salt of the tetrasulphuric acid ester of tetrahydro-1:2-2':1'-dianthraquinoneazine (20 per cent strength)	10
Water	735
Tragacanth thickening	50
Sodium chlorate solution (of 33 per cent strength)	80
Ammonium nitrate solution (of 50 per cent strength)	120
Ammonia (25 per cent strength)	5
	1000

The material is dried, steamed for 8 minutes, washed, soaped at the boil, rinsed and dried.

In a similar manner derivatives of the tetrasulphuric acid ester of tetrahydro-1:2-2':1'-dianthraquinone-azine, as for example tetrahydro-3:3'- dichloro - 1:2 - 2':1'- dianthraquinoneazine, may be developed.

It is evident that the present process may be applied for the development of leuco-ester salts of any other vat dyestuff which is sensitive or not sensitive to over-oxidation.

What I claim is:

1. In the production of dyeings and prints from dyestuffs of the N-dihydro-1:2-2':1'-dianthraquinone-azine group with the aid of leuco ester salts of these dyestuffs by acid oxidation, a process for obviating overoxidation, which comprises applying to the fibre a composition containing a tetrasulphuric acid ester of said group and a suitable oxidizing agent, and conducting the development of the dyeing by steam in presence of ammonium nitrate, which furnishes the necessary acid in the heat and acts at the same time as buffer substance.

2. In the production of dyeings and prints from dyestuffs of the N-dihydro-1:2-2':1'-dianthraquinoneazine group with the aid of leuco ester salts of these dyestuffs by acid oxidation, process for obviating overoxidation, which comprises printing onto the fibre a composition containing a tetrasulphuric acid ester of said group and a suitable oxidizing agent, and conducting the development of the dyeing by steam in presence of ammonium nitrate, which furnishes the necessary acid in the heat and acts at the same time as buffer substance.

3. In the production of dyeings and prints from dyestuffs of the N-dihydro-1:2-2':1'-dianthraquinoneazine group with the aid of leuco ester salts of these dyestuffs by acid oxidation, a process for obviating overoxidation, which comprises applying to cotton a composition containing a tetrasulphuric acid ester of this group and a suitable oxidizing agent, and conducting the development of the dyeing by steam in presence of ammonium nitrate, which furnishes the necessary acid in the heat and acts at the same time as buffer substance.

4. In the production of dyeings and prints from dyestuffs of the N-dihydro-1:2-2':1'-dianthraquinoneazine group with the aid of leuco ester salts of these dyestuffs by acid oxidation, a process for obviating overoxidation, which comprises applying to the fibre a composition containing a tetrasulphuric acid ester of this group and sodium chlorate, and conducting the development of the dyeing by steam in presence of ammonium nitrate, which furnishes the necessary acid in the heat and acts at the same time as buffer substance.

5. In the production of dyeings and prints from dyestuffs of the N-dihydro-1:2-2':1'-dianthraquinoneazine group with the aid of leuco ester salts of these dyestuffs by acid oxidation, a process for obviating overoxidation, which comprises applying to the fibre a composition containing the sodium salt of tetrahydro-1:2-2':1'- dianthraquinoneazine and a suitable oxidizing agent, and conducting the development of the dyeing by steam in presence of ammonium nitrate, which furnishes the necessary acid in the heat and acts at the same time as buffer substance.

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